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Developing the ornamentals industry in the Pacific: an opportunity for income generation

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1 Acronym list

AASPM	Agreement on the Application of Sanitary and Phytosanitary Measures
ACIAR	Australian Center for International Agricultural Research
ANU	Australia National University
AQIS	Australian Quarantine and Inspection Services
AusAID	Australian Agency for International Development
CDF	Commodity Development Framework (Fiji)
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CTA	Technical Centre for Agricultural and Rural Cooperation ACP-UE
DPI NT	Department of Primary Industries Northern Territories
EHPEA	Ethiopian Horticultural Producers and Exporters Association
ESCAP	UN Economic & Social Commission for Asia & the Pacific
FCA	Fiji College of Agriculture
FDB	Fiji Development Bank
FFC	Fiji Floriculture Council
FHA	Fiji Hotels Association
FQIS	Fiji Quarantine and Inspection Services
FVB	Fiji Visitors Bureau
GCC	Golden Cowrie Complex
GDP	Gross Domestic Product
GOR	Government Ordered Rates
ILO	International Labour Organization
IRC	Internal Revenue Commission (PNG)
ISPM	International Standards for Phytosanitary Measures
KARI	Kenya Agricultural Research Institute
MAFF	Ministry of Agriculture, Fisheries and Forestry
MAL	Ministry of Agriculture and Lands
MCIT	Ministry of Commerce, Industry, Trade and Public Enterprise
MH	Morris Hedstrom (Fiji)
NAQIA	National Agriculture Quarantine and Inspection Authority (PNG)
NARI	National Agriculture Research Institute (PNG)
NARS	National Agriculture Research System (PNG)
NBG	National Botanical Garden (PNG)
NCBG	National Capital Botanical Garden (PNG)
NCSMED	National Center for Small and Micro Enterprise Development (Fiji)
NFI	National Forest Institute (PNG)
NHO	National Highlands Orchids
NZ MAF	New Zealand Ministry of Agriculture & Forestry
PICs	Pacific Island Countries
PITIC	Pacific Island Trade and Investment Commission
PNGFAS	Papua New Guinea Floral Arts Society
PVR	Plant Variety Rights
SARP	Samoa Anthurium Research Project
SOHC	Suva Orchid and Horticulture Circle
SPC	Secretariat for the Pacific Community
SSO	South Sea Orchids (Fiji)
SSSPP	Smallholder Support Services Project (PNG)

TA	Technical Assistance
TAFE	Technical and Further Education
TB	Treasury Bills
TPAF	Training and Productivity Authority of Fiji
UH	University of Hawaii
UNDP	United Nations Development Program
UNITECH	Papua New Guinea University of Technology
UNSD	United Nations Statistics Division
UPNG	University of Papua New Guinea
USAID	United States Agency for International Development
USP	University of the South Pacific
WTO	World Trade Organization

2 Acknowledgments

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The conclusions drawn and the interpretation of the data provided remain the responsibility of the authors.

3 Executive summary

Globally, horticulture, including floriculture, has become a lead sector for poverty reduction in developing countries. This, however, has not been the case for the Pacific Islands where horticultural and floriculture exports are miniscule.

While the scoping study specifically covers Fiji and PNG, much of the findings are seen as relevant for the region as a whole. The economic contribution of the Fiji and PNG floriculture industries is small. However, in the case of Fiji the industry generates livelihoods for a significant number of people.

Fiji's comparative advantage in ornamental horticulture lies in supplying the domestic market. The industry has made good progress in realising this opportunity with respect to the non-tourist domestic market. It has been less successful with respect to the tourism segment which offers the most growth potential. Niche export opportunities have been identified for specialty leaves and for indigenous orchids sold in compliance to CITES. This Study recommends institutional reforms to facilitate the realisation of these opportunities.

PNG offers some outstanding agro-ecological conditions for cut flowers and foliage. However, in terms of export market development these advantages are more than offset by intractable marketing and other constraints. It is highly unlikely that PNG would be able to establish a cut flower export industry comparable to that of East Africa and Central America. However, a worthwhile cut flower industry could be built around a significant expansion of the domestic market, supplemented by niche export of specialty products. PNG has the potential to establish a major commercial indigenous orchid industry exporting unique hybrid plants and expanding eco-tourism activities. This hinges on regulatory and policy reforms pertaining to CITES being addressed.

A number of potential activities are identified for ACIAR/SPC involvement in the development of ornamental horticulture in the Pacific islands. For Fiji these are:

- red ginger decline research
- the development of a Gardeners Guide to Fiji's Native Plants
- the development of pilot "Fiji Flowers" quality assurance and certification scheme
- a review of Fiji's quarantine regulations and procedures relating to floriculture
- the development of cost effective quarantine treatments for ornamentals.

For PNG the activities are:

- policy development for minor forest products
- an adult education program development for ornamental horticulture and floral art
- technical advice on the establishment of a wholesale marketing system
- a feasibility study for the re-development of the Lae National Botanical Gardens
- industry organization development.

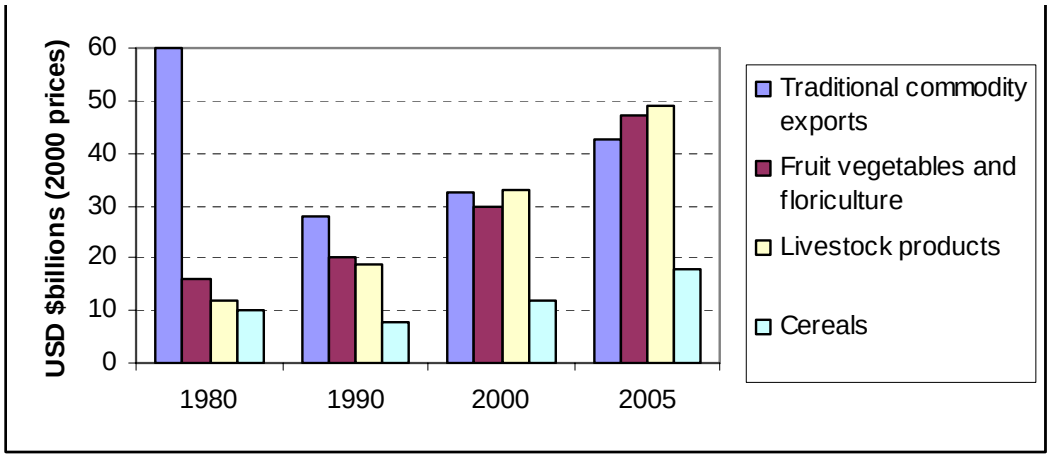
A number of the recommended activities are regional in nature. These are developing a policy framework for Melanesian countries to progress with the sustainable commercial development of non-timber forest products, a framework for indigenous orchid hybridisation and technical support for tertiary institutions in the development of ornamental horticulture skills.

4 The Global Context for Pacific Island Ornamental Horticulture

4.1 The PICs and the horticulture trade revolution

A revolution is occurring in the export of horticultural and floriculture products from developing countries. Overall, high value products (including horticulture, livestock, fish, cut flowers and organic products) now make up 66 percent of all developing country agricultural exports. This is significantly more than the 21 percent accounted for by traditional tropical products (United Nations Commodity Trade Statistics Database). The real value of traditional commodities fell dramatically from 1980 to 1990 (Figure 1). Since then, recovery has been marginal, with the total export value remaining lower than the 1980 value. In contrast, the value of horticultural and other high value commodity exports has grown rapidly over the last two decades. Developing countries have gained market share at the expense of developed countries. In 2005, developing countries held a 56 percent share of world trade in fruit and vegetables (excluding bananas and citrus). In 2005, the value of exports from the fruit, vegetable and floriculture group accounted for 30 precent of all developing country agricultural exports. This was a marked increased from the 1980 figure of 16 percent (Figure 2).

Figure 1: The Value of developing country agricultural exports



Source: United Nations Commodity Trade Statistics Database presented in McGregor (2007)

Globally, authors have identified this horticulture revolution as a mechanism for poverty reduction(Ali 2006, Leonhardt 2006). Specifically, floriculture has been a lead sector in Ethiopia, Kenya and Columbia. Leonhardt (2006) has noted particular achievements of the export floriculture industry in a number of developing countries:

- **East African exports to the EU** Kenya (USD 200 million annually) and Uganda (USD 36 million annually). One Kenyan grower ships 1.5 million rose stems daily and Ugandan growers' ship 500, 000 roses for Valentine's Day.
- **South East Asian exports primarily to Japan** Thailand (USD 50 million annually), Malaysia and Singapore (USD 10 million annually).

The value of floriculture products in the Horn of Africa is now over euro 60 million (ITC/MNS 2007), with the Ethiopian industry being the fastest growing in that grouping[1].

1 ITC/MNS 2007 reports that 68 investors had developed 750 hectares under greenhouses and another 150 hectares of tunnel or open field production. Around 70 percent of flowers produced in the country are exported to Holland.

Pacific Island Countries (PICs) are not yet part of this horticultural revolution. This is despite often having suitable agro-ecological conditions. The total value of PIC non-commodity agricultural exports in 2005 was around AUD 66 million. In the same year, the region's total exports to Australia stood at AUD 2,640 million. Taro, squash, noni juice and vanilla beans are the most important non-commodity agricultural export products. This overall poor export performance is particularly disappointing in the context of the following:

- these are agriculturally based economies
- highly suitable agro-ecological conditions can often be found for the products (e.g. the Highlands of PNG for temperate fruit and vegetables and floriculture products; in Fiji, western Viti Levu for tropical fruit)
- the impressive global growth performance by developing countries in the export of horticultural and other high value agricultural products
- the noted comparative advantage in the production and export of these products (ADB 1985, ADB 1997, ADB 2004, AusAID 2006).

Floriculture product exports from the region are miniscule – around AUD 8,000 in 2005. The PICs are also found to have a significant net trade deficit in floriculture products. This situation is surprising, given the ability of the PICs to produce floriculture products and the apparent demand in Pacific Rim markets. The poor floriculture trade performance of the PICs contrasts markedly to that observed for the comparable regions of East Africa, Central America and the Caribbean. These countries have a substantial trade surplus in floriculture products.

This scoping study analyses the reasons behind the disappointing overall performance of PIC trade in floriculture products. Recommendations are given on how this situation might be redressed to allow floriculture to make a significant contribution to growth and poverty alleviation in the region.

4.2 The world floriculture industry

4.2.1 Overall trade in floriculture products

The value of world production of floriculture products is estimated at approximately €100 billion (AIPH/Union Fleurs: International Statistics Flowers and Plants, 2006). Around 10 percent of this production enters international trade. Leonhardt (2006) projects trade in floriculture products to increase by 3.5 percent annually to 2012.

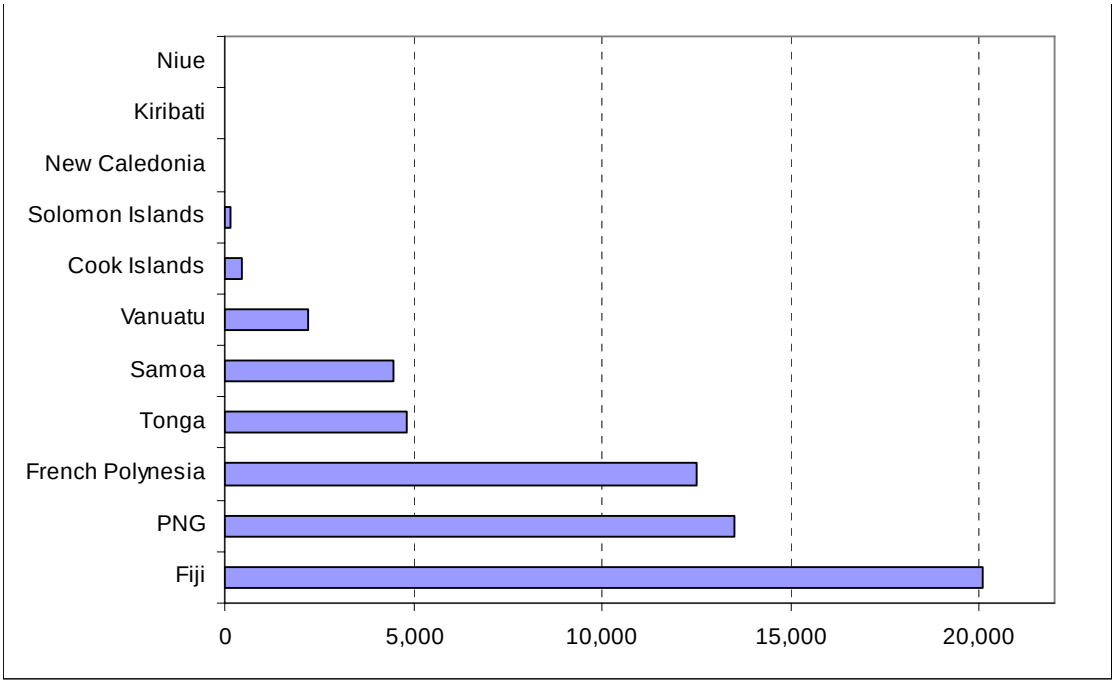
The main importers of cut flowers and pot plant products in 2004 were Germany and the UK, with USA following close behind (Figure 3). New emerging floriculture markets have been established in Russia, India and China.

*Table 1: A summary of non-commodity agricultural exports from PICs (2005)**

Country	Product	Market	Approx value (AUD ,000)
Fiji	Root crops	Aus/NZ/US	12,500
	Root ginger	NZ/US/Euro	845
	Papaya	Aus/NZ/Jap.	1,230
	Mangoes	NZ	50
	Eggplant	NZ	1,525
	Breadfruit	NZ	55
	Chillies	NZ	75
	Okra	Aust/NZ	33
	Spices	Aus/NZ/US	530
	Noni juice	Aust/US/Euro	213
	Cut flower bulbs	NZ	3
Sub-total			17,059
Tonga	Squash	Japan	9,000
	Vanilla	USA/Aus/Jap/NZ/Euro	3,500
	Coconuts	Aust/NZ	310
	Root crops	Aust/NZ	280
Sub-total			13,090
PNG	Copra meal	Aus/NZ	3,500
	Spices (vanilla)	Aust/NZ/US/Jap/Euro	10,000
Sub-total			13,500
French Polynesia	Noni juice	USA/Aus/Jap/NZ/Euro	12,500
Samoa	Bananas	NZ	2
	Breadfruit	NZ	20
	Coconuts	NZ/Aus	290
	Coconut cream	NZ	910
	Papaya	NZ	5
	Noni juice	NZ/Aus/US	3,230
	Taro	NZ	10
Sub-total			4,467
Vanuatu	Beef	Japan/Aus	1,300
	Root crops	Aust	310
	Coconut meal	Aust/NZ	1,100
	Citrus	NZ	33
	Vanilla	US/Aus/Japan	130
	Essential oils	Aust	450
Sub-total			3,323
New Caledonia	Citrus	NZ	70
	Squash	Japan	1,500
	Preserved meat product	Aust	180
Sub-total			1,750
Cook Islands	Taro	NZ	10
	Papaya	NZ	35
	Cut flower & bulbs	NZ	5
	Noni juice	NZ/Aust/US	420
Sub-total			470
Solomon Islands	Cold press coconut oil	US/Aust	93
	Copra meal	Aust	28
	Noni juice	Aust/Korea	35
Sub-total			156
Nuie	Honey		4
	Taro		32
Sub-total			36
Kiribati	Copra meal		65
Grand Total			**66,416**

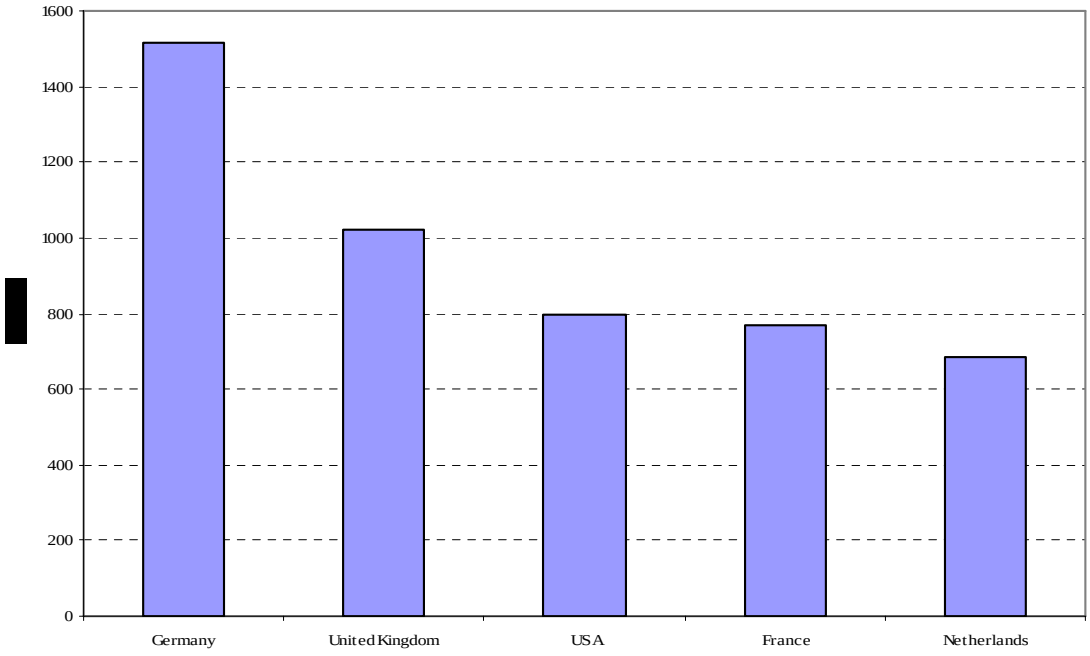
Source: McGregor (2007).

Figure 2: Approximate value of all PIC non-commodity agricultural exports to all markets (2005 fob AUD '000)



Source: McGregor (2007).

Figure 3: Summary of cut flower and pot plant importers



Europe	Country	Million EUR
	Germany	1516
	UK	1019
	France	771
	Netherlands	684
	Italy	296
	Switzerland	289
	Others	1800

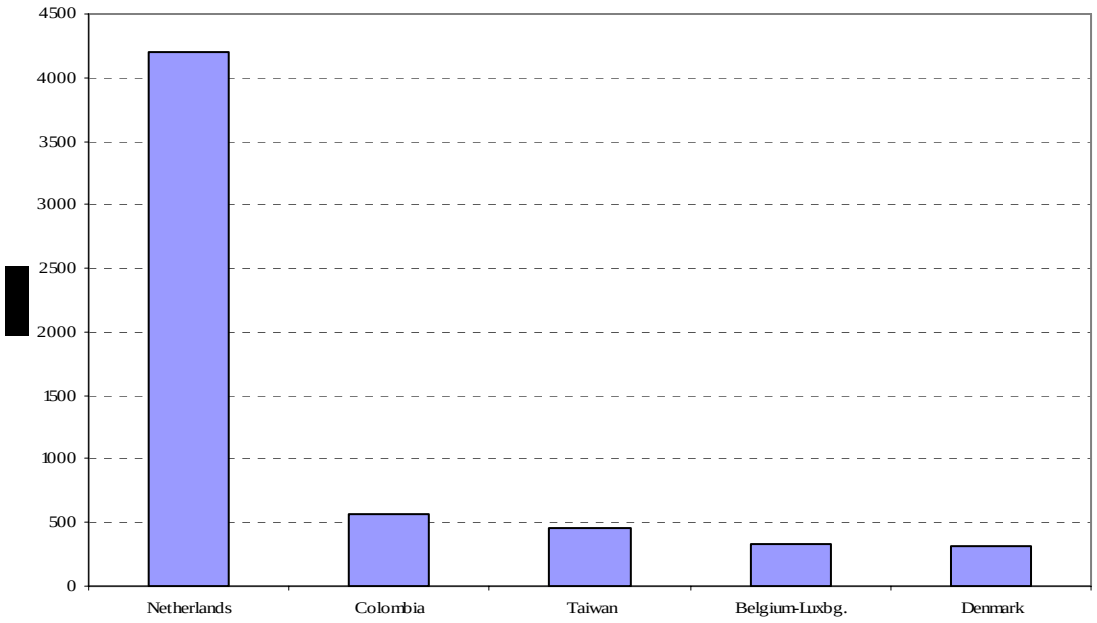
Asia		
	Japan	269
	Taiwan	59
	Hong Kong	35
	Korea	35
	Others	320
America		
	USA	800
	Canada	160
	Others	440
Others		960
World total		**9500**

Source: AIPH / Union Fleurs: International Statistics Flowers and Plants 2006

By far, the leading exporter of floriculture products is the Netherlands, followed by Colombia and Taiwan. East African producers are the leading emerging suppliers. Annual Kenya and Uganda exports to the EU are now around USD200 and USD36 million respectively.[2]

The Netherlands is notably also the 5th largest importer of floriculture products (Figure 4). Furthermore, the Netherlands is a major player in the export trade of tropical flowers, being the world's largest producer and exporter of anthuriums.

Figure 4: Summary of world floriculture exports 2004



Europe	Country	million EUR
	Netherlands	4023
	Denmark	313
	Belgium-Luxbg.	328
	Italy	271
	Germany	224

[2] *Leonhardt (2006) reports that one Kenyan grower supplies 1.5 million roses daily to the EU and an individual Ugandan growers supplies 500,000 roses for Valentine's Day.*

	Spain	136
	Others	700
Asia		
	Israel	190
	Taiwan	454
	Thailand	80
	China	83
	Singapore	30
	Others	135
Africa		
	Kenya 2005	271
	Zimbabwe	81
	South Africa	30
	Zambia	24
	Others	105
America		
	Colombia	566
	Canada 2001	280
	Ecuador	261
	Costa Rica 2001	110
	USA 2001	98
	Others	150
Others		970
World total		**9950**

Source: AIPH / Union Fleurs: International Statistics Flowers and Plants 2006

4.2.2 Trade in tropical ornamental horticulture products[3]

Most tropical floriculture products produced are exported for sale. Hawaii and the Pacific Islands floriculture industry are an exception in this respect.

Tropical products are estimated to make up 4-5 percent of the total floriculture trade, valued at approximately euro 400-500 million annually. Orchids and anthuriums make up 90 percent of this trade. Leonhardt (2006) identifies potential growth for tropical floriculture products in travel and tourism; luxury hotels, resorts and restaurants. However, a study by Rikken (2006) on the market for tropical flowers and foliage in the European Union presents quite a different picture. The conclusions of the report were:

- A noted worldwide overproduction of tropical flowers
- Quality requirements in the European market are becoming more stringent
- Decreasing prices and demand resulting in lowered imports of tropical flowers.

Orchids

World trade in orchids exceeds euro110 million annually. This trade is approximately divided between cut flowers (80 percent) and potted orchids (20 percent). Asian countries dominant trade in orchids, with Taiwan and Thailand being the largest exporters. The value of Taiwan's orchid exports in 2005 was euro 52 million (mainly potted phalaenopsis and paphiopedilum and oncidium cut flowers). Thailand's annual orchid exports are around € 36 million (mainly dendrobium cut flowers to Japan). Singapore and Malaysia export around € 7.3 million in orchids, again mainly to Japan.

[3] *This section draws heavily on Leonhardt 2006 and AIPH/Union Fleurs 2005.*

The farm value of Hawaii's orchid production in 2005 was €17 million, most of which was sold within the State in the form of potted plants (Statistics of Hawaii Agriculture, 2006). There is also a growing orchid trade from the Caribbean and Central America; namely from Costa Rica, Panama, Colombia, Jamaica and Trinidad & Tobago.

Anthuriums

Holland dominates world trade in anthuriums, producing over 50 million stems annually. The Dutch anthurium industry is characterised by extremely high productivity, with growers achieving over 100 stems annually per square meter. The other major anthurium exporters are Mauritius (15 million stems annually) and Hawaii (10 millions stems). The emerging anthurium producers are in Latin America, the Caribbean and China. The main markets for anthuriums are Germany, Italy, Japan and the USA. The wholesale price for Hawaiian anthuriums on the Tokyo and Osaka markets range from €.60 to € .85 depending on colour.

Gingers, heliconias and bird of paradise

Other internationally traded tropical flowers are gingers and heliconias. World trade in these products can be divided into broad geographic groupings:

- Producers in the Caribbean and Central America (Costa Rica and Ecuador) are the leading exporters. Brazil, Jamaica, Dominican Republic, Colombia, Mexico and Guatemala supply the US market. Hawaii also supplies the US mainland.
- Producers in Africa (Canary Islands, Ivory Coast, Cameroon, Tanzania) and Sri Lanka supply the EU.
- Hawaii supplies the Japanese market and Malaysia supplies the Singapore market.

Rikken (2006) found that the EU market for heliconias and other tropical flowers is relatively small and sensitive to oversupply. He concluded that:

In this very characteristic niche market, only specialized importers/wholesalers are able to make some money. It is estimated that there are about 10-15 specialised importers in Europe. Therefore, exporters are advised to differentiate their offer and create aggressive marketing campaigns to tackle the existent albeit reduced opportunities in this market (2006,p. 3).

Tropical foliage

Tropical foliage (palms, dracaena, philodendron, aglaonema, dieffenbachia, bromeliads and ferns) are a fast growing segment of the world floriculture industry. The value of US consumption of these products in 2005 was € 465 million, with domestic production from Hawaii and Florida and main imports from Costa Rica, Dominican Republic & Guatemala. Bangladesh, India, Cameroon and the Ivory Coast are significant exporters of foliage to the EU. The demand for new foliage varieties were identified by Rikken (2006) as one brighter spot for tropical ornamental products.

4.2.3 Trade in temperate flowers from the tropics

Certain tropical countries have suitable climatic conditions for the production of temperate flowers. These conditions are usually found in the highland regions of the tropical country. A few of these tropical countries have been able to exploit these conditions and develop successful floriculture industries based on the production of temperate flowers. A summary of the trade of three selected temperate flowers from the tropics is provided below. These figures are all drawn from AIPH/Union Fleurs: International Statistics Flowers and Plants, 2006.

Roses

African producer Kenya exported roses valued at euro 155,170,000 in 2005. Ecuador's rose exports in 2003 were worth 207,254,000 euro and Colombia in 2004 exported 174,427,000 euro worth of roses. From tropical Central America, Costa Rica had rose exports valued at 265,000 euro in 2000.

Chrysanthemum

Kenya's exports of chrysanthemums in 2005 were valued at 2,932,000 euro. Costa Rica exported 6,203,000 euro worth in 2000 and Colombia 63,470,000 euro worth in 2004.

Carnation

South American producers Colombia and Ecuador topped the tropical countries exporting carnations with 134,278,000 euro and 1,197,000 euro respectively. Costa Rica exports of carnations were worth 13,000 euro in 2000. Kenya also had sizable exports of carnations with a total of 12,082,000 euro in 2005.

4.2.4 The emergence of the East African ornamental horticulture industries

The emergence of East African producers as major exporters of floriculture products over the last few decades is of particular interest to this scoping study. This interest stems from the fact these industries are situated in tropical highland locations that are not agro-ecologically dissimilar to those found in the Highlands of PNG. The proposition to be explored in this scoping study is whether, based on the East African experience, the agronomic conditions found in parts of the PNG Highlands offer a sufficient competitive advantage to provide the basis for a major floriculture export industry.

Kenya

Kenya exports around $US110m of floriculture products. Kenya and is the largest exporter of floriculture products to Europe, with Holland being the main market (www.kenyaflowers.co.ke). This industry is based entirely on temperate flowers, with the main exports being roses, statice, carnations and alstromeria (in total over 45 varieties are exported). This industry directly employs 40,000 to 50,000 people and a further 60,000 to 70,000 in ancillary industries. In total around ½ a million people are dependent on the industry. Flowers now account for around 8 percent of Kenya's export earnings. To put this in perspective, this is an industry that contributes as much to rural livelihoods in Kenya as does the coffee industry in PNG.

The Kenyan floriculture industry dates back to the mid-1970s. At that time a few growers started growing and exporting flowers from around the Lake Naivasha area. The success of these early pioneers had an important demonstration effect on off-shore investors. The exceptional highland growing conditions, relatively low labour costs and good transportation links encouraged the direct investment of large Dutch, German and UK floriculture companies. These companies were vertically integrated operations producing, transporting and marketing flowers through their own chartered cargo space and their marketing organizations.

In the late 1980s, the Kenyan floriculture industry experienced rapid growth with the commencement of rose exports. This saw the entry of much smaller sized enterprises selling under their own name at Dutch flower auctions (Feldt, 2001). The expansion into rose exports also saw the growth of smallholders contracted to nucleus enterprises. The World Bank and USAID had substantial involvement in project funding. There remains considerable smallholder involvement in the Kenyan industry.

Recent years have seen a structural change occurring in the Kenyan industry with the development of new varieties that don't require green houses. These varieties[4], developed by the Kenya Agricultural Research Institute's (KARI) Embu Station, can be grown in open fields using rain water[5]. These smaller growers have formed themselves into groups to meet the minimum volume requirements of the market - "Exporters need 3,000 stems at any one time, therefore farmers need to form groups of 15 to 60 to meet the demand," (Magoti, 2007).

Ethiopia

According to David Grey of FloraCulture International, Ethiopia now has the fastest growing floriculture industry in the world, on par with the Ecuadorian industry in the 1990s (FloraCulture International, 2007). There are now approximately 750 ha of roses under plastic houses, a further 150 ha of field flowers and some 50 ha for the propagation of plants for export, such as chrysanthemums and pelargoniums. According to the Ethiopian Horticultural Producers and Exporters Association (EHPEA), the area under rose production is increasing at such a rate that the 3,000 ha target may be reached within the next three years; "truly putting Ethiopia on the world map as a major producer of florals, overtaking Kenya on the way" (FloraCulture International, 2007).

Ethiopian highlands provide "near ideal" growing condition for roses and other temperate flowers (allium, carnation, carthamus and statice). The areas around Addis Ababa, not only have excellent agro-ecological conditions (altitude of about 2000 meters) for temperate flower production, there is also a surprising high quality of infrastructure in place. David Grey describes the apparent paradox of the Ethiopian floriculture industry:

An estimated 60 percent of its 70 plus million population are living in 'absolute poverty' and has international notoriety for droughts and starvation. Despite these challenges, Ethiopia does have: a world class, international airline and flight connections to 22 domestic airports; excellent main roads; plenty of water in rivers and underground (by all accounts); a fantastic and intriguing history; great tourism potential; and, the fastest growing floriculture industry in the world (FloraCulture, International 2007).

There are reported to be 25 foreign floriculture companies operating in the most suitable areas south of Addis Ababa (www.ethiopiaemb.org.cn/bulletin).

A notable feature in the development of the Ethiopian floriculture sector has been strong government and institutional support through the Ethiopian Investment Agency and the Ethiopian Horticulture Producer-Exporters Association Assistance has also been provided by the Dutch government through the Ethiopia-Netherlands Horticulture Partnership. Some of the specific incentives on offer to horticulture and floriculture investors include:

- duty free importation of capital goods for the business
- duty free car for the manager and importation of household goods for the manager
- income tax holiday for 5 years when production is exported
- roll over of losses.

In Ethiopia all land belongs to the State, but it can be leased either under very favourable terms for up to 35 years, or subleased from a farmer for a shorter term under a "willing seller, willing buyer" arrangement. The large State farms (a legacy from the Communist era of the 70s an 80s) are being carved up and offered out to commercial interests, especially for horticultural development. Lease rates in areas favoured for floriculture range between $1,100 and $4,400 per hectare per year. Leasing has its advantages as it relieves the investor of the capital cost of buying land, possibly in hard currency.

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[4] *These varieties include Arabicum, Crocosmia, Mobydick, Tuberose and Gladiolus.*
[5] *Kenya: Small Scale Farmers Turn to Floriculture. Nairobi Business Daily 1 August 2007*

Financing terms for investing in the Ethiopian floriculture industry are attractive, particularly for Dutch companies. The Development Bank of Ethiopia is the favoured source of loans. Generally, the interest rate for short-term working capital is 7-8 percent per annum, 8-9 percent, for medium-term and 9-10 percent for long term (FloraCulture International, 2007). The investor is normally expected to put up 30 percent as collateral. For Dutch based companies, financing of up to 60 percent is available towards start up costs through the Programme for Cooperation with Emerging Markets (PSOM), which is aimed principally at medium to small projects with a Dutch-Ethiopian partnership.

A major constraint to the expansion of the Ethiopian industry has been identified as the lack of knowledge and experience of local Ethiopians. However, there are now a significant number of diplomats and graduates through the Jimma University's College of Agriculture & Veterinary Medicine, which has developed close link with the internationally acclaimed Wageningen University in Holland. There is also strong Dutch support for on the job training programs in Ethiopia.

In summary, a combination of factors has attracted substantial foreign investment in the Ethiopian floriculture sector. Much of this investment has come from Dutch floriculture interests. These are listed below. In parenthesis is a brief assessment of the Pacific Islands with respect to each factor, with particular reference to the PNG Highlands:

- outstanding agro-ecological conditions (parts of PNG Highlands are judged to have equivalent conditions)
- good infrastructure, in terms of roads, power, telecommunications, and water supply, in the most suitable production areas (poorer overall - particularly poorer in the PNG Highlands)
- substantial, frequent and reliable airfreight capacity (reasonable for Fiji, extremely poor for the PNG Highlands and adjudged to be the most critical limiting factor)
- proximity to global markets (the Pacific islands significantly disadvantaged with respect to the largest markets of Europe and North America, the reasonable proximity to Asian markets offset for PNG by poor transportation links)
- low wages (overall wage rates significantly higher in the PICs)
- access to land on long term rental basis (land access a major constraint to foreign investors in PNG)
- high level of donor assistance to sector (support for the horticulture sector has not been a focus of donor support to the PICs)
- attractive government incentives (no particular incentive to agribusiness investors in the PICs – PNG’s deficit financing policies has lead to a high interest rates regime that discriminates against investors in agriculture).

Tanzania

Tanzania is now emerging as the next major East African player on global floriculture markets. This country is particularly well positioned to take advantage of European and Middle Eastern floriculture and horticulture markets. Tanzania has over 88 million hectares of agricultural land (of which less than 6 percent is currently utilized) and offers a wide range of climactic zones for the full-range of floriculture and horticulture products, from high-altitude temperate zones to low-land tropical zones (Kearney, 2007). Significantly, there are frequent and regular air connections from Kilimanjaro and Dar es Salaam. These airports provide direct access to European and Middle Eastern markets. Large tracts of suitable land for temperate flowers in Tanzania Southern Highlands have recently been opened up by the opening of the Mbeya International Airport. The country has a well established domestic horticultural export industry being a traditional shipper of

fresh produce to neighbouring countries. Kearney (2006) reports that Dutch floriculture interests and other European investors are now investing in the emerging Tanzanian floriculture sector. The institutional base is reported to be strong with well organised associations promoting coordination with the government and international donors. Both the donors and government have identified floriculture and horticulture as a priority growth sector and can provide extensive support for investments in this sector. Kearney (2006) notes that Tanzania's environment, physical assets and incentives for floriculture and production, offers a stable and favourable business environment

4.2.5 The emergence of China on international floriculture markets

China is emerging as a major player in international floriculture markets – both as a consumer and producer. Flower consumption is reported to be increasing by over 20 percent per year driven by demand from a middle class of 200 million people, supportive government policy and plentiful and cheap land (Leonhardt, 2006). Substantial growth in tropical flowers is occurring in tropical Hainan Province. However, it is Yunnan province which is receiving the most attention from industry watchers, there are over 30,000 growers and two auction houses have recently opened. Japanese buyers have seats at both these auctions. There is increasing Dutch and German investment in China's ornamental horticulture industry China is seen as the sleeping giant of international floriculture trade. Leonhardt (2006) identifies a number of issues and constraints that are currently holding back the Chinese industry before they make a major mark on the world floriculture market. These include:

- intellectual property protection
- inadequate horticultural training
- low product quality
- poor post-harvest knowledge and practices
- high freight costs and airline preference for non-perishables.

The expectations are that most of the weaknesses will be overcome in a relatively short period of time, with events moving quickly in China.

4.2.6 Oceania floriculture trade[6]

Available floriculture trade date was analysed for Australia, New Zealand, Fiji, New Caledonia, French Polynesia, Papua New Guinea, Samoa, Vanuatu, Solomon Islands, and Tonga. Australia and New Zealand, not surprisingly, dominated both the export and import of floriculture products from the region.

Ornamental horticulture exports from the region are more than 4 times ornamental horticulture imports into the region (Table 2). In 2005, exports from the region stood at USD 45 million and imports at USD 11 million. Thus the Oceania region had ornamental horticulture trade surplus of USD 34 million.

Table 2: Aggregate trade in ornamental floriculture products from Oceania 2002-2005 (USD)

Year	Exports	Imports	Trade balance
2002	39,202,140	6,367,382	32,834,758
2003	38,713,529	7,771,886	30,941,643
2004	44,663,859	10,074,142	34,589,717
2005	45,229,030	11,206,589	34,022,441

Source: UNSD Comtrade Datebase 2007

[6] *Oceania is taken to include Australia and New Zealand and the countries and territories of the Pacific Islands*

Floriculture exports from the region

New Zealand is by far the largest exporter of floriculture products from region, with the value of shipments over the period 2002-2005 being nearly USD 1 billion (Table 3). Australia's floriculture exports over the same period were approximately USD 70 million. However, put these floriculture exports in perspective they are substantially less than those of Kenya, Thailand, Costa Rica and Ecuador.[7]

Amongst the PICs, only French Polynesia approach anywhere near significant exports of floriculture products, with the value of exports over the period 2002 to 2006 totalling around USD 330,000. Most of these exports are to France. Over the same period, Fiji and the Cook Islands each exported around USD 60,000 of floriculture products. Fiji sporadically exports small quantities of anthuriums and heliconias to New Zealand, along with the occasional shipment of foliage. The Cook Islands exports are made up of maile leaf exports to Hawaii for use in traditional leis.

Table 3: Floriculture Exports from Oceania Countries: 2002-2005 (USD)

Country	Value
New Zealand	$97,752,293
Australia	$69,597,712
French Polynesia	$330,933
Fiji	$62,404
Cook Islands	$60,010
Other reporters (inside selection)	$5,206
Total Export:	$167,808,558

Source: UNSD Comtrade Database 2007

Floriculture imports into the region

Australia is by far the region's largest importer of floriculture products, with imports over the period 2002-2006 totalling USD 26.4 million (Table 4). New Zealand's imports over the same period were USD 4.7 million. The French territories of New Caledonia and French Polynesia also had significant imports of floriculture products - USD2.5 and USD 1.5 million respectively over the period 2002 and 2006. UNSD Comtrade Data base showed that Fiji, Cook Islands, Papua New Guinea and Samoa all import floriculture products. While these volumes are small[8], they are significantly more than the value of floriculture products they export. As such, while the Oceania region collectively, has a substantial trade surplus in floriculture products, the PICs have a significant net trade deficit in floriculture products (Table 5 and Figure 5). This trade deficit is surprising given the ability of the PICs to produce floriculture products that are in demand in Pacific Rim markets. The floriculture trade deficit for the Pacific islands contrasts markedly to that observed for the comparable regions of East Africa, Central America and the Caribbean.

[7] *The value of exports of these 3 countries in 2001 is reported by AIPH/Union Fleurs (2003) to be:*

	1,000 euros
Kenya	230,000
Ecuador	229,431
Thailand	80,000
Costa Rica	78,550
New Zealand	23,586

[8] *In the case of Papua New Guinea the Comtrade Database significantly underestimated the level of floriculture imports. According to Internal Revenue Commission data in 2004 PNG imported floriculture products valued at around kina 140,000. The Fiji Bureau of Statistics reports that in 2005 FJD 205, 000 of floriculture products were imported into Fiji.*

Table 4: Floriculture Imports by Oceania Countries: 2002-2005 (USD)

Countries	Value
Australia	$26,384,903
New Zealand	$4,690,838
New Caledonia	$2,489,003
French Polynesia	$1,547,796
Fiji	$192,564
Cook Islands	$56,028
Papua New Guinea	$32,529
Samoa	$26,338
Total Import:	$35,419,999

Source: UNSD Comtrade Database 2007

5 The Fiji Case Study

5.1 Floriculture in Fiji

5.1.1 Industry overview

Overall Industry structure

Floriculture in Fiji is a small industry but with a relatively large number of participants. Based on a survey conducted as a part of this review it is estimated that over one thousand people are directly involved in the industry. Most of the participants are located on the main island of Viti Levu and concentrated around the main urban centers of Suva in the east and Nadi in the west. The vast majority of these participants are women (Figure 6).

The survey found:

- Approximately 200 semi-commercial cut flower growers and a few small commercial growers. It is estimated that these growers employ around 50 people.
- One cut flower wholesaler, supplying florists and hotel buyers with orchids, anthuriums and some heliconias. This wholesaler employs 6 full time workers.
- 26 florists that are registered as businesses - of these about half operate out of a shop with the balance operating out of private residences. On average, it was estimated that florists employed 1.5 persons each.
- 40-50 informal flower arranging businesses that operate out of their homes.
- Several hundred women sell floricultural products in the main municipal markets.
- 3 exporters who sporadically ship small volumes of floriculture products.
- 12 retail nurseries that sell a range of potted plants and garden supplies.
- Several hundred small growers of a wide range of potted plants and trees for sale.

Figure 6: Three generations of flower growers at Moana Village, Rewa, and flowers seller at the Suva market

The origins of Fiji's commercial floriculture industry

The driving force behind the development of Fiji's commercial floriculture industry has been South Sea Orchids (SSO). Don and Aileen Burness, the current owners of SSO, established and managed the "Land of the Sleeping Giant" orchid farm near Lautoka for the actor Raymond Burr in 1960. The "Land of the Sleeping Giant" orchid facility was for collector and display orchids. Revenue was generated from tourist tours that continue to this day. This provides the first example of linking floriculture development to tourism in Fiji.

In the mid-1970s, the Burness's purchased Raymond Burr's property at Saweni Beach and created SSO. Shade houses for commercial cut flower dendrobium orchids were established for the first time in Fiji. Dendrobium planting material was sourced from the University of Hawaii (UH) with technical advice provided by Emeritus Professor Sagawa from the University Hawaii. Dr Sagawa continues to provide ongoing advice to the Fiji floriculture industry as well as to Samoa and the Solomon Islands.

The South Sea Orchids Model

In early 1995, SSO undertook a feasibility study for extending its dendrobium operation to small out growers in the surrounding area. The study, jointly funded by UNDP and the Fiji-New Zealand Business Council, concluded that it was feasible to establish an out-grower program for dendrobium orchids. The study also recommended that anthuriums be added to the program to spread the overheads of services required to support out growers. These recommendations were accepted by SSO.

In 1997, a permit was issued to SSO to import anthurium planting material from Dutch based supplier, Anthura Inc. Dutch nurseries, unlike those in Hawaii and Australia, could supply plantlets certified free of anthurium leaf blight. In the early 1990s, this disease had devastated the Hawaii industry. Despite this status, it took nearly two years for SSO to negotiate with the Fiji Quarantine Service a protocol under which these plants could be imported. In 1998, 30 village growers who joined the SSO program were financially assisted into the industry through grants obtained under the Ministry of Agriculture's Commodity Development Framework (CDF) Scheme. These funds were used for the purchase of materials to construct small shade houses and purchase orchid and anthurium planting material. CDF funds were also allocated to SSO to operate a small extension service to support the out growers for a period of two years. SSO assisted other non-village growers to prepare business plans which enabled them to secure small business loans from the Fiji Development Bank (FDB) to establish their floriculture operations. In addition, SSO secured a FDB loan to relocate and expand their operations to Nasau near Nadi (Figure 7).

Figure 7: The SSO operations Nasau, Nadi with their out growers

The SSO Out grower Feasibility Study identified a major constraint to small business involvement in the industry was the absence of a wholesale market for flowers, where the small growers could sell their cut flowers and the small florists could readily source their supplies. It was pointed out that both groups were spending a lot of time and energy trying to find each other and there was no market growth. To overcome this marketing constraint, two wholesale cut flower markets (anthuriums and dendrobium orchids) were established in Nadi (1999) and Suva (2001). All of the SSO out growers under their contractual arrangements are required to sell through these wholesale markets.

SSO, together with their contracted out growers and marketing outlets now comprise the core of Fiji ornamental's horticulture industry. This group is made up of 82 growers, who have a combined total of five acres under shade. This group commands an estimated 180,000 flowering plants (table 6).

Table 6: The structure of the SSO floriculture network

	Number of growers	Location	estimated area undershade (acres)	estimated number flowering plants
SSO nucleus	1	Nasau (Nadi)		
dendrobium orchids			1	70,000
anthuriums			1	22,000
Outgrowers				
dendrobium orch	38	mainly Nadi - Lautoka	1	30,000
anthuriums	43	maninly Suva - Nausori	2	60,000
Total	82		5	182,000

As well as this, over 100 heliconia and ginger growers operate independently of SSO. Of these growers only Roi Ltd. at Navua is of commercial scale, with 15-20 acres of gingers and heliconias under cultivation.

5.1.2 The growers of ornamentals in Fiji

The orchid segment

Fiji's indigenous orchids

According to Smith, there are 171 species of orchids found in Fiji - 164 are indigenous and 51 are endemic to Fiji (p, 321). All indigenous species are covered by the Convention of the International Trade in Endangered Species of Wild Fauna and Flora (CITES) and cannot be shipped outside Fiji without a permit.

Most of Fiji's orchid species fall into the dendrobium family (genera). They are mainly found in the remaining tropical rainforests. There are also some unique species in higher altitude on the drier side of Viti Levu where native forest has not been destroyed. Only a few of Fiji's indigenous orchids have large and attractive flowers. Most have small to miniature flowers, with some lasting for a day or less. A number of Fiji's better known indigenous orchids are featured in special stamp issues 1997 and 1999: (www.stampsfiji.com/orchids.htm.) These are:

- *Dendrobium biflorum* is only found on Viti Levu and Ovalau in areas of strong light from sea level up to 900 meters. The plants grow as epiphytes on trees. The flowers, usually in pairs, are about 3cm across with thin and spidery, pale creamy/yellow petals and sepals that last only one day.

- *D. prasinum* ("primrose" flower) is one of the most interesting endemic species. It only occurs at altitudes from 600 to 1,150 meters. A miniature epiphyte with 4cm white flowers with green base lip. The orchid is a collector's item that can be purchased internationally via tissue culture.

- *D. dactylodes* is only found on Viti Levu in areas from sea level to 900 meters. This epiphyte grows in humid forest. Flowers last only one day and darken in the afternoon before closing.
- *Spathoglottis pacifica* is a common terrestrial orchid often found growing along the roadside in wetter areas. It is found in open forest in wet areas and in Lau, Kadavu and the Yasawas. The orchid is characterized by 4 or 5 pleated leaves on short pseudobulbs. The inflorescence starts from the base of the plant and cane is up to 1.5 tall with 10 flowers. The flowers range in colour from deep pink, mauve to almost white. Yellow and deep purple species are imported. They can last several days when cut.

Perhaps the most famous of the Fiji orchids is the *D. tokai* . This orchid, which is indigenous to Viti Levu's wet zone, is one of the parents of the first Hawaiian hybrid dendrobium orchid. The other parent is *D. phalaenopsis* (Cook Town Orchid) from Queensland Australia. Numerous species of exotics have been imported into Fiji. Many of these appear to grow naturally in the wild.

Commercially grown orchids

None of Fiji indigenous orchids are grown commercially. There are a range of commercial orchid types suited to Fiji's conditions. These include hybrid dendrobiums, cattleyas, vandas, phalaenopsis, paphiopedilums, and oncidiums.

The dendrobium orchids commercially grown in Fiji have been sourced from the University of Hawaii (UH). Referred to as the 'Uniwai Series,' these hybrids were derived from combining two species of dendrobium orchids – *D. phalaenopsis* and *D. gouldii* (Leonhardt and Sewake p, 10). Within the Uniwai Series, a wide range of seed propagated varieties have been developed. These seed propagated varieties provide virus-free and affordable plants.

The main UH cultivars that have been brought into Fiji are listed below:

UH no.	Name	Colour	UH no.	Name	Colour
44	Jaquelyn Thomas 'Uniwai Blush'	blush	800	Jaquelyn Thomas 'Uniwai Mist'	White
232	Jaquelyn Thomas 'Uniwai Supreme'	lavender two-tone	1081	Uniwai Royal	Purple
306	Jaquelyn Thomas 'Uniwai Pearl'	white	1233	Nellie Sugii	Pink
503	Jaquelyn Thomas 'Uniwai Prince'	purple	1276	Tessie Amore	pink
507	Jaquelyn Thomas 'Uniwai Princess'	light purple	1426	Jaquelyn Thomas	lavender two tone

Source: Leonhardt and Sewake p, 10

The colour range of the UH cut flower cultivars is limited in comparison to what is available from Singapore or Thailand[9]. However, this is compensated by their proven capability under Fiji conditions and longer vase life. The UH colours are popular in Fiji, particularly white. In the future, the limited colour range could be a problem when competing with Singapore orchids in the Australian and New Zealand markets. Breeding is now being done using Uniwai Series with some S.E. Asian varieties to increase the colour range.

UH dendrobiums are perhaps the most sought after cut flower in Fiji. Their delicate beauty, attractive colours and long vase life mean they are in high demand from the tourist industry and local people alike. These orchids convey an image of prestige and a sophisticated life style and take pride of place in wreaths, bouquets and flower arrangements. Western Viti Levu, with its relatively hot and dry conditions and high levels of solar radiation, is ideally suited to growing orchids. There is heavy flowering from early summer (November) to late autumn (May). Throughout the remainder of the year flowering is light with intermittent flushes.

The commercial orchid industry

Commercial orchid growing was introduced to Fiji in the early 1980s by South Sea Orchids (SSO). Today there are an estimated 38 semi-commercial dendrobium orchid planting enterprises. These enterprises range in size from 200 to 3,000 plants, with most

[9] *Missing from the colour range of the "Uniwai" series are yellow, green, red, candy stripes and art shades.*

having around 500 plants. These are mainly found in the Nadi/Lautoka area. At the nucleus of these growers is SSO, with 70,000 flowering dendrobium orchids at Nasau, Nadi. A majority of the dendrobium orchids are sold as cut flowers to local florists and flower arrangers. Approximately 250 dendrobium orchid plants are used for plant rentals at the Nadi International Airport, and the Sheraton Resort.

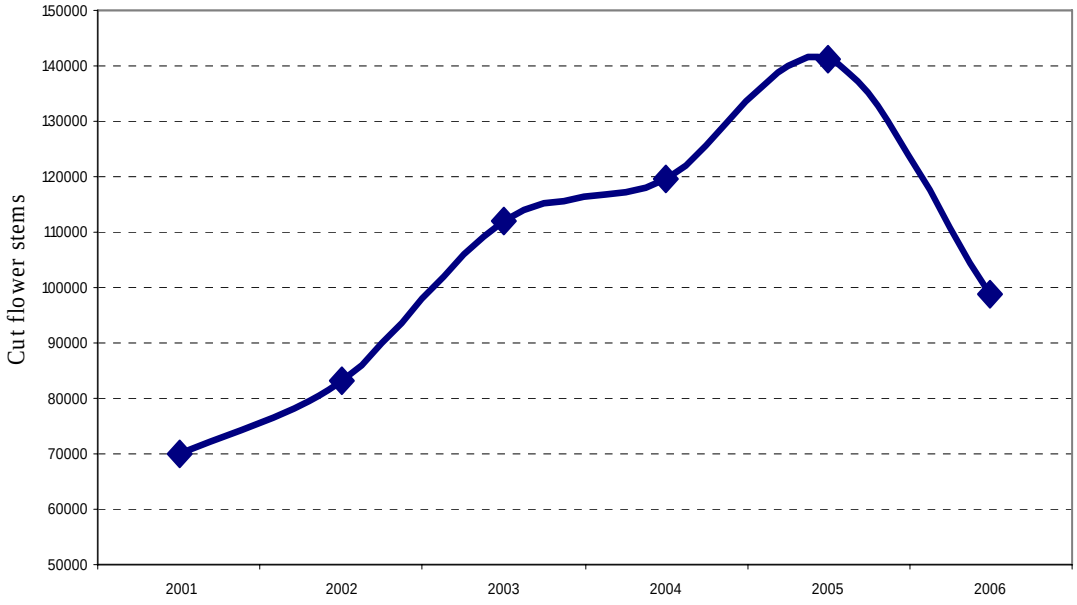
Figure 8: Orchid types suited to Fiji's growing conditions

		
Dendrobium	Oncidium	Vanda

Sales

Orchid sales through the SSO wholesale market have increased steadily from around 7, 000 sprays in 2001 to peak at 14, 000 sprays in 2005, falling back to 10,000 sprays in 2006 (Figure 9).

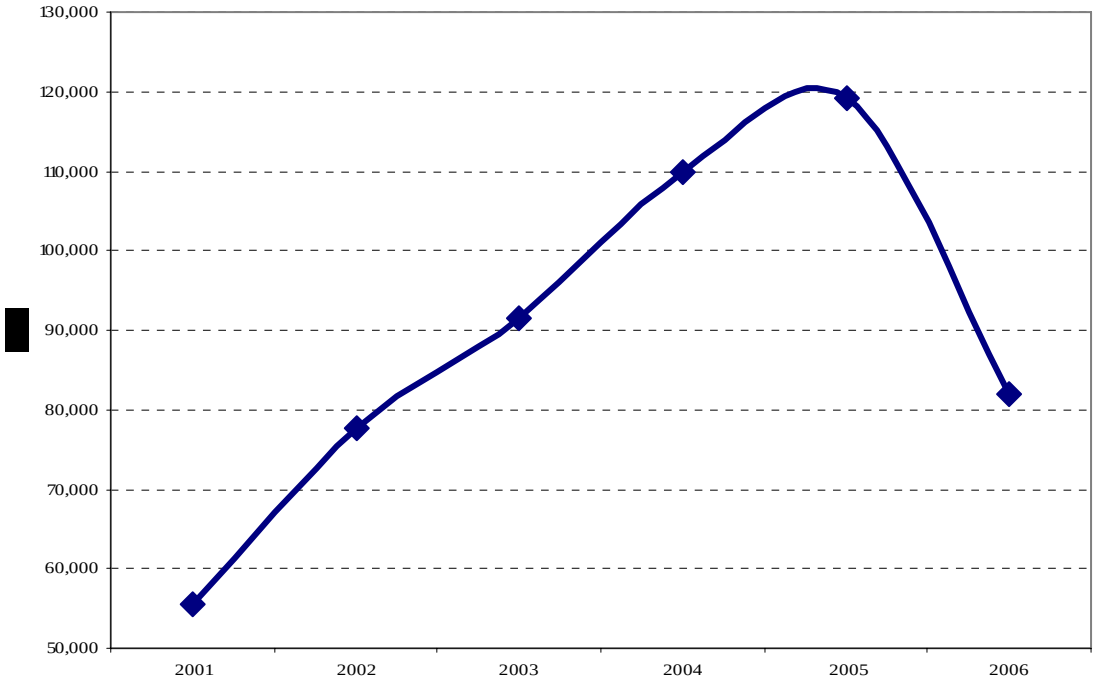
Figure 9: Wholesale dendrobium orchid sales in Fiji



Source: SSO Floriculture Project Report, 2006.

As shown in Figure 10, SSO records show that the wholesale value of orchid increased steadily from approximately FJD 58,000 to reach FJD 119, 000 in 2005 and falling back to FJD 81,900 in 2006 (Figure 10). The decline in the volume and value of sales in 2006 is attributed to some contracted growers selling outside the SSO wholesale system. The break down in the structured marketing system now poses a serious threat to the future development of a Fiji floriculture industry based on small holder growers.

Figure 10: Wholesale dendrobium orchid revenues



Source: SSO Floriculture Project Report, 2006

Income earned by out growers

Orchid growers who have followed the package of practices specified by SSO have been able to earn worthwhile livelihoods. Table 6 shows the returns earned by an out grower, starting with just 200 dendrobium orchid plants and selling cut flowers to SSO. Over a 10-year period, the grower earns an average annual gross margin of around FJD 1,300 and a return to person day of effort of FJD 20.

Table 6: The financial returns from a micro dendrobium orchid enterprise

Year		1	2	3	4	5	6	7	8		Total
Plants		200	200	220	230	250	280	300	300		
Revenue ($)											
Small spray #			400	600	600	620	650	700	700		4,270
revenue @50c/spray			200	300	300	310	325	350	350	$	2,135
Medium spray #				300	500	500	520	540	560		2,920
revenue @ 95c/spray			-	285	475	475	494	513	532	$	2,774
Large spray #				250	420	900	910	930	950		4,360
revenue @ $1.20/spray			-	300	504	1,080	1,092	1,116	1,140	$	5,232
Keiki (plantlet) sales											
#						10	20	35	50		115
revenue @ $4 each						40	80	140	200	$	460
Total revenue ($)			**200**	**885**	**1,279**	**1,905**	**1,991**	**2,119**	**2,222**		**10,601**
Costs ($)											
Shade house		985									
Plants @ $5 each		1,000									
Other capital items		130				50					
Fertilizer and agro chemicals		60	60	60	60	60	60	60	60		
Total cost ($)		**2,175**	**60**	**60**	**60**	**110**	**60**	**60**	**60**		**2,645**
Cash flow ($)		**(2,175)**	**140**	**825**	**1,219**	**1,795**	**1,931**	**2,059**	**2,162**		**10,270**
Cummulative cash flow($)		**(2,175)**	**(2,035)**	**(1,210)**	**9**	**1,804**	**3,735**	**5,794**	**7,956**		
Labour inputs (person days)											
Cleaning and bagging gravel		2				1					3
Planting		1				0.5					2
Daily husbandary (watering, weeding)		55	50	50	55	55	55	55	55		430
Harvesting and grading			3	7	10	15	15	15	15		80
Total labpour imput		**58**	**53**	**57**	**65**	**72**	**70**	**70**	**70**		**515**
Av. annual gross margin ($)	**$**	**1,284**									
Av. return per day of family labour	**$**	**20**									

The women who own such a micro enterprise would be able to earn more working at a hotel, if she can secure such a job. However, the flower growing enterprise only requires an average of some 50 days of labour per year. As such it is an enterprise that could be combined with other wage earning employment to supplement the income of the household or provide employment for otherwise unemployed adult children or siblings. Having your own small or micro floriculture enterprise with an assured market might prove less risking than working in a hotel subject to layoffs during quiet periods. A small or micro floriculture business offering flexibility in labour inputs is particularly suited to women with young families.

Using the SSO out grower model in poverty alleviation

SSO is now contributing to the livelihoods of some of Fiji's poorest and most disadvantaged rural households (Figure 11). Following a request from the Fiji Rotahomes Project, SSO has agreed to establish a pilot floriculture scheme at the Koroipita Model Town near Lautoka. The pilot scheme will be undertaken as a joint venture with the Fiji Rotahomes Project. AusAID has agreed to provide start-up funding of FJD 100,000. A number of activities will be funded by AusAID that will allow the Koroipita Pilot Scheme to be successfully incorporated into SSO's Out grower Program in a way that enhances the overall viability and sustainability. These are:

- Financial assistance to 20 disadvantaged Koroipita female residents to purchase planting material (200 plants) and to establish a small shade house (FJD 1,175).
- The establishment of a small extension service to cater for the needs of the Koroipita pilot scheme and other out growers.
- Introducing *Bromeliad* sp. as an additional product line to enhance the viability of SSO's marketing operations.

Figure 11: Koroipita Floriculture project

In the proposal to AusAID it is projected that:

- Initially 15 successful flower growing enterprises will be established at the Koroipita settlement.
- A successful pilot scheme which will lead to additional flower growing micro enterprises being established at Koroipita and at other Fiji Rotahome settlements. The target is to establish 30 such enterprises over the next 5-year period.
- Small flower arranging enterprises to be developed at Koroipita, as an extension of the pilot scheme.
- 10 new out growers establishing bromeliad growing enterprises.

The anthurium segment

Anthuriums (*Anthurium andrianum*) are renowned for their wide range of colours and types and their exceptionally long vase life. The common pink “local” variety of anthurium has long been grown in Fiji and is a regular feature in wreaths and flower arrangements.

Improved variety anthuriums have been especially bred for colour, size, productivity and vase life (Figure 12). The first improved variety anthurium plants were imported from Australia and planted at Colo-i-Suva near Suva some 25 years ago. The plants thrived in the warm, wet conditions of the area. More recently anthurium plants were imported from Florida by the Golden Cowrie Complex (GGC) at Navua, approximately 30 kilometres from Suva. At its peak, the GCC had an estimated 20,000 plants under shade.

Figure 12: Improved variety anthuriums make up the industry in Fiji

Midori

Choco

Cheers

The most recent importation of anthuriums has been by SSO from Holland, the world leader in the production of anthurium planting material. The Dutch plants were distributed to 33 small growers located mainly around Suva.

Figure 13: Village anthurium out growers

SSO now has 43 out growers of improved variety anthuriums ranging in size from 200 to 1,500 pots (Figure 13).These growers command a total of around 60,000 flowering plants. These are mainly located around Suva. In addition, SSO currently has over 35,000 improved variety anthurium plants at their Nadi operation.

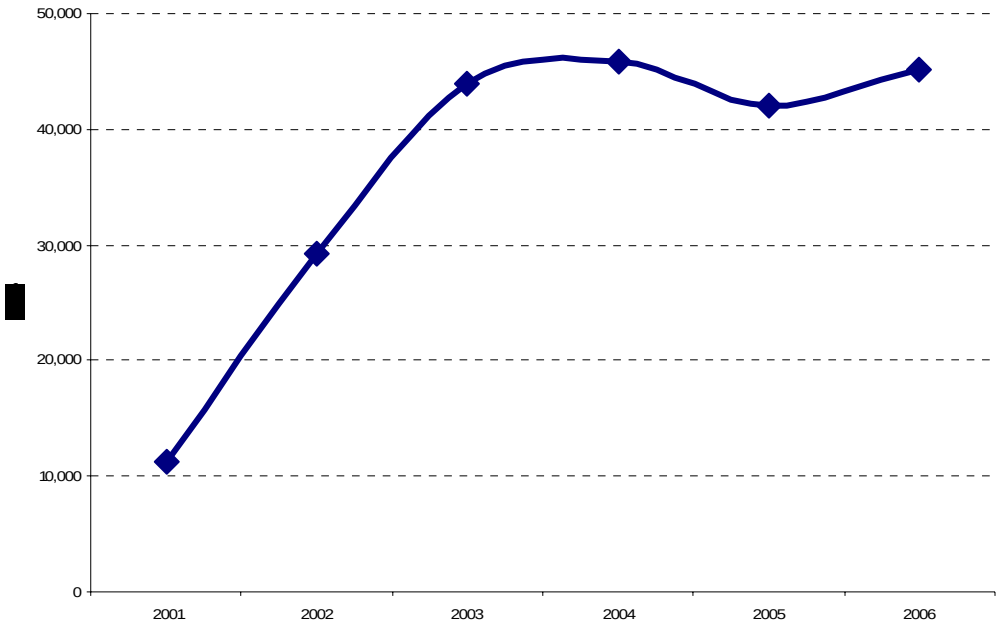
Sales

Anthurium sales through the SSO wholesale market have increased steadily from around 20,000 stems in 2001 to over 60,000 stems in 2006. Over that period, the value whole value of these sales increased from FJD 10,000 to FJD 46,000 (Figure 14). It is notable that anthurium whole sales in 2006 did not drop, whereas dendrobium orchids did. This reflects the greater marketing discipline and loyalty amongst the larger anthurium out growers.

Income earned by out growers

The small or micro anthurium enterprise offers similar grower returns to that obtained by orchid growers. Table 7 shows the returns obtained for a micro anthurium (200 plants) enterprise.

Figure 14: Wholesale anthurium sales in Fiji



Source: SSO Floriculture Project Report, 2006.

Table 7: The returns from a micro anthurium enterprise

Year	1	2	3	4	5	6	7	8	Total
Micro enterprise (200 plants)									
Revenue									
Small blooms #	400	480	0	0	0	0	0	0	
Revenue ($) @ 33c/stem	132	158	0	0	0	0	0	0	
Medium blooms #		900	400	400	400	400	400	400	
Revenue ($) @55c/stem		495	220	220	220	220	220	220	
Large blooms #		360	1,600	1,600	1,600	1,600	1,600	1,600	
Revenue ($) @ 65c/stem			1,040	1,040	1,040	1,040	1,040	1,040	
Total revenue ($)	**132**	**653**	**1,260**	**1,260**	**1,260**	**1,260**	**1,260**	**1,260**	**8,213**
Expenses									
Shade house (from table 2)	375								
Plants	880								
Other capital items	76								
Fertiliser and other agrichemicals	82	60	60	60	60	60	60	60	
Total expenses	1,414	60	60	60	60	60	60	60	
Cash flow	**-1,282**	**593**	**1,200**	**1,200**	**1,200**	**1,200**	**1,200**	**1,200**	**6,380**
Labour inputs		Person days							
Cutting coconut husks for media	3								
Mixing media and planting	2								
Daily husbandry (watering, fertilising ect.) average 1.5 hours day	65	65	65	65	65	65	65	65	
Harvesting and grading	2	5	7	7	7	7	7	7	
Total labour input	72	70	72	72	72	72	72	72	574
Average annual gross margin ($)	**797**								
Average return per day of family labour ($)	**11.4**								

The ginger and heliconia segment

In Fiji, flowering gingers and heliconias are a popular cut flower, used in wreaths and flower arrangements. The striking bold features and long vase life of some ginger and heliconia types make them particularly suited for displays in public places such as hotel lobbies and corporate offices (Figure 15). Up until the introduction of improved variety anthuriums and dendrobium orchids, gingers and heliconias were the backbone of the floral arranging industry. These flowers still make up the majority of arrangements in hotels across the country. Gingers and heliconias are still the most common flower sold in the local municipal markets, which is a growing segment.

Figure 15: Ginger and heliconia varieties commonly used in floral arrangements

Red and pink ginger – *Alpinia purpurata*

Lobster claw – *Heliconia bihai*

Sassy – *Heliconia psittacorum*

Heliconias are native to tropical America. Most commercial heliconias are identical to their wild counterpart – which contrasts to dendrobium orchids and anthuriums. There is a great variety of heliconia types, with some 400 species identified. Over the years, many new varieties have been introduced to Fiji – unfortunately often illegally smuggled into the country. In the Suva area, there are several improved ginger and heliconia varieties, with areas exceeding an acre. The largest is Roi Ltd., who has around 15-20 acres of gingers and heliconias under cultivation at Navua.

Income earned by growers

The prices received for ginger and heliconia are significantly lower than that received for cut flower orchids and anthuriums and marketing risks are considerably higher. However, these considerations are offset to some extent by the higher yields obtained, the much lower capital cost of getting started (provided the grower has access to land) and the much shorter lag between planting and production. Thus, provided growers can obtain a market, gingers and heliconia offer good returns to growers (Table 8). In the model presented below, the grower earns around FJD 3,300 per annum and return to family day of labour of around FJD 55 from an average of around 80 days work per year. If this particular grower has to spend a lot of time marketing their flowers, which is often the

case, the returns for effort will be substantially reduced. Ginger and heliconia growers often sell their flowers at roadside stalls (Figure 16).

Figure 16: Ginger and heliconia growers selling their flowers at a roadside stall, Nausori.

Table 8: Cash flow projections from growing and selling 1 acre of heliconia

Year	1	2	3	4	5	6	Total
Area planted (acres)	0.1	0.5	1.0	1.0	1.0	1.0	
Number of plants	500	2,500	5,000	5,000	5,000	5,000	
Number of flowering plants	250	.1,750	5,000	5,000	5,000	5,000	
Marketable flowers (5 per flowering plant)	1,250	8,750	25,000	25,000	25,000	25,000	
Revenue @ 30c/marketable flowers (allowing 5c/flower transportation)	**313**	**2,188**	**6,250**	**6,250**	**6,250**	**6,250**	**27,500**
Expenses							
Plants (10 x 5 colours @ $3/plant)	150						
Poultry manure (100 bags @ $3/bags)	100	100	100				
NPK (13:13:21) 400 kgs @ 80c/kg	80	80	80	80			
Tools (spade, knife, seceteurs etc.)	200						
Total expenses	**530**	**180**	**180**	**80**	**0**	**0**	
Cash flow	**-218**	**2,008**	**6,070**	**6,170**	**6,250**	**6,250**	**26,530**
Labour inputs		Person days					
Land clearing	20						
Land preparation	20						
Daily husbandry (pruning, weeding, fertilising ect.)	65	65	65	65	65	65	
Harvesting and grading	4	10	14	14	14	14	
Total labour input	109	75	79	79	79	79	500
Average annual gross margin ($)	**3,316**						
Average return per day of family labour	**55**						

The potted plants and tree segment

Several hundred small growers around Fiji offer a wide range of potted plants and trees for sale. Many of these are women from villages and settlements. There are around a dozen medium sized nurseries that sell potted plants and operate plant hire businesses. The largest of these is Plant World and Flower Power located near Suva.

The potted plant and tree segment is divided into three broad categories:

- Exotic ornamental plants (e.g. Bougainvillea, Ixora, Cordyline, Guzmania, Dieffenbachia, Dracaenea and various palms species).

Red Lipstick palm
Cyrtostachys lakka

Guzmania vella

- Native trees and shrubs (e.g. Bua ni Viti, Bua Sala ,Lagakali, Mocelolo, Uci, Mokosoi, Kukuwalu, Kakala and Vasivasi) as well as timber tree species (e.g. vesi and yaka).

Mokosoi- *Cananga odorata*

Tavola – *Terminalia catappa*

- Exotic ornamental flowering trees (e.g. Cassia sp, Flamboyant trees Caliandra sp)

Honolulu rainbow shower – *Cassia fistula x javanica*

Flamboyant tree – *Delonix regia*

Figure 17: A demonstration ornamental production house set up by the Taiwan Technical Mission in the Sigatoka Valley

Plant sale events serve as the main point of sale for potted plant growers in Fiji. The large number of growers participating at plant sale events and the amount of plants sold is a clear indication of the income earning opportunity provided by such events. Currently there are about 12 plant sale events per year in the Suva and Nadi areas where growers can bring their potted plants and sell directly to customers. In 2003, Grow Fiji Ltd. began operations in Suva at the Garden City Complex. This provides an outlet for five growers to sell potted plants on a daily basis. Some of the larger nurseries supply landscape contractors and hotel developers with plants. There is considerable scope for substantially expanding this line of activity. Plant hire for offices, hotels and the Nadi international airport is a growing area of business that also offers expansion opportunities.

Income earned by growers

For a grower with their own land, the potted plant business can be highly profitable, as shown in Table 9:

Table 9: The returns from small and micro potted plant enterprises

Micro business	
Number of plants sold	1,000
Price per plant ($)	2
Revenue ($)	**2,000**
Expenses ($)	
Potting mix (@3.2c/plant)	32
PB 3/4 planting bags @2c each	20
Shovel (10")	20
Transport to selling point (15 return trips @ $4 a trip shared with other sellers)	60
Space hire (@ $3/day shared with other sellers)	45
Total expenses ($)	**177**
Labour (person days)	

Small business	
Number of plants sold	10,000
Price per plant ($)	1.00
Revenue ($)	**10,000**
Expenses ($)	
Second hand mixer	150
3 shovels	30
shade cloth for small nursery	150
Potting mix (@3.2c/plant)	320
PB 3/4 planting bags @2c each	200
Delivering plants to sellers	210
Total expenses ($)	**1060**
Labour (person days)	
Sourcing and preparing seeds and cutting	18
Sourcing potting mix materials	18

Sourcing and preparing seeds and cutting	2
Sourcing potting mix materials	2
Mixing and turning potting materials	4
Filling bags and planting	3
Watering plants	2
Marketing	15
Total labour	**28**
Gross margin ($)	**1,823**
Return to person day of effort	**65**

Mixing and turning potting materials	8
Filling bags and planting	25
Watering plants	8
Loading and delivering plants	6
Total labour input	**83**
Gross margin	**8,940**
Return per person effort	**108**

The micro business can be expected to earn around $1,800 a year. This requires a labour input of approximately 28-person days. Thus the return per day labour input is around $65. The small business can be expected to earn around $9,100 a year. This requires a labour input of approximately 83-person days. Thus the return per day labour input is around $110. This is almost double that of the micro business. The large difference in the returns to labour can be explained by this being a wholesaling enterprise. As such, large amounts of time do not have to be spent on marketing at plant sales and other events.

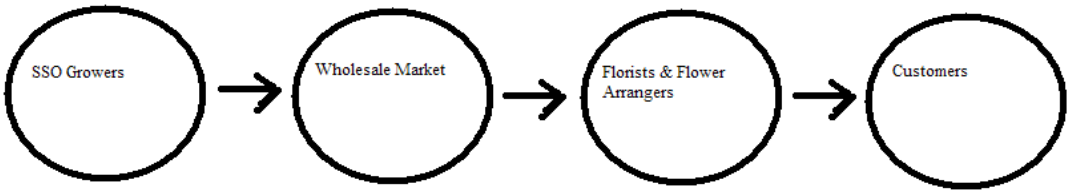
5.1.3 The marketers of ornamentals in Fiji

Wholesalers

Fiji's first and only wholesale cut flower market was established in 2001 with two markets open in Suva and Nadi for orchids and anthuriums (Figure 18). For the growers and end users of cut flowers, this development has meant that a degree of orderly marketing replaced a previously chaotic situation. The simple marketing value chain that was created is illustrated schematically in Figure 19.

Figure 18: Anthuriums and orchids ready for florists at SSO wholesale market

Figure 19: Marketing value chain for the SSO wholesale cut flower markets



The growers could now focus on producing quality cut flowers. In turn, the florists could now aggressively promote their products assured that a dependable supply base at a reasonable price is in place. The result was a significant expansion in the market for these flowers. The Fiji Agricultural Policy Framework Report[10] summaries the important role the creation of a small wholesale market has played in developing a commercial floriculture industry in Fiji:

A major constraint to the development of the industry was the absence of a wholesale market, where the small growers could sell their cut flowers and the small florists could readily source their supplies. Both would spend a lot of time and energy trying to find each other and there was no market growth. To overcome this marketing constraint a wholesale cut flower market (anthuriums and dendrobium orchids) was established by South Sea Orchids (SSO) in 2001. Grower members of the SSO Project bring their cut flowers to the wholesale market on their designated day. The growers include village producers from Toga in Rewa. At the end of each month the growers are paid for the previous month's delivery at predetermined prices. The florists have standing orders with the wholesale market, which they collect on their designated day. If supplies are short, flowers that are available are shared pro-rata amongst the florists. If available supply exceeds standing orders then the surplus is available on a first served basis. The wholesale market has meant that orderly marketing has replaced a previously chaotic marketing situation. The growers can now concentrate their energies entirely on producing quality cut flowers. The florists can now aggressively promote their products assured that a dependable supply base at a reasonable price is in place. As a result of the orderly marketing created by the wholesale market, there has been a 5-fold increase in cut flower sales in Suva over an 18-month period (despite the poor economic climate at the time). In a situation where it appeared there was no market, supply has been able to generate its own demand (p, 37).

The 70 odd growers that supply the SSO wholesale markets are contracted to sell (and SSO contracted to buy) at agreed prices and quality standards. The current grower buying prices and wholesale selling prices are presented in table 10 below.

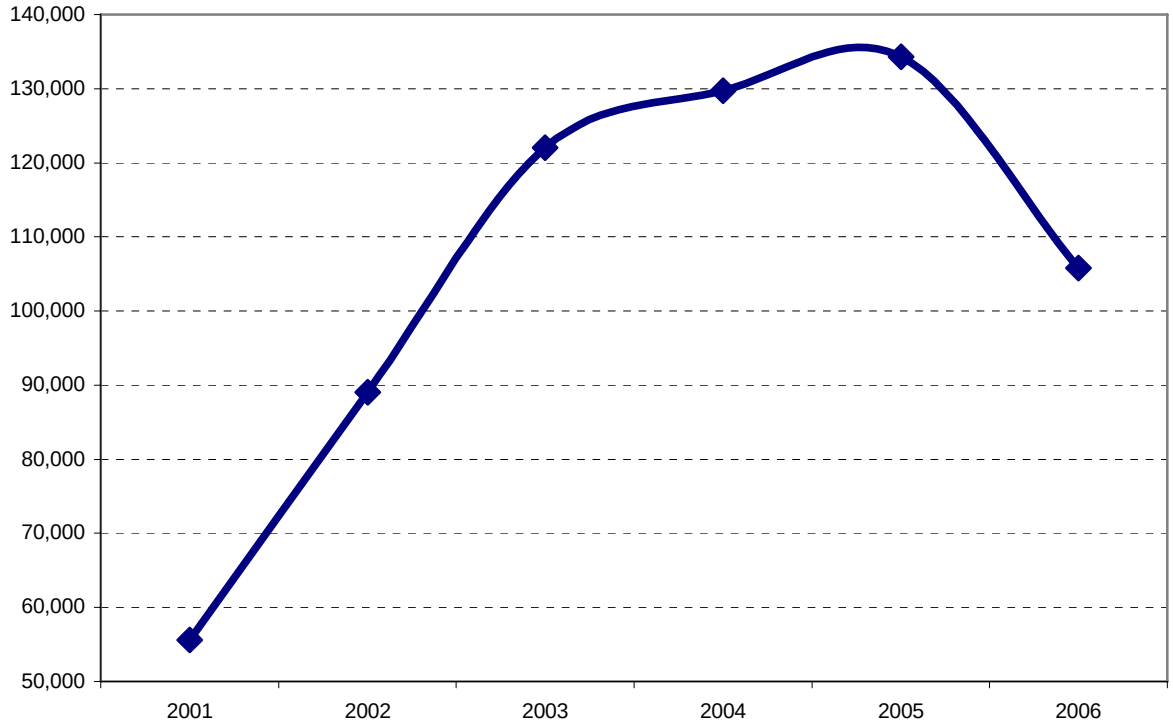
Table 10: The SSO pricing structure for cut flowers

Anthuriums			
Flower size	Grower prices @ SSO $/stem	Wholesale selling price @ SSO $/stem (VIP)	Marketing margin $/stem (VIP)
Large (dia > 4")	0.70	1.00	0.30
Medium (3-4")	0.60	0.90	0.30
Small (<3")	0.38	0.72	0.34
Mini (<2")	0.16	0.42	0.26
Dendrobium orchids			
Spray size	Grower prices @ SSO $/spray	Wholesale selling price @ SSO $/spray (VIP)	Marketing margin $/spray (VIP)
Large (> 15 blooms)	1.13	1.66	0.53
Medium (10 – 14 blooms)	0.90	1.35	0.45
Small (4-9 blooms)	0.45	0.68	0.23
Seconds (<4 blooms and spray with large gaps)	0.20	0.40	
Single blooms		.12	

In 2006, SSO's wholesale market sold 63,626 anthurium stems and 98,680 orchid sprays valued at FJD127, 210 to some 50 customers. From these sales, the growers were paid FJD 105,810 (Figure 20).

[10] *McGregor Andrew and Gonemaituba Waisiki. The Fiji Agricultural Market Policy Framework Study Dec. 2002.*

Figure 20: Dendrobium orchid and anthurium grower revenues ($FJD)



Source: SSO Floriculture Project Report, 2006.

Florists and flower arrangers

There are currently 10 florists (8 in Suva and 2 in Nadi/Lautoka) registered as businesses that operate out of shops. The two main florists are Tadra Flowers and Roi Ltd., both with retail outlets around the country.

Tadra Flowers (Figure 21) has been successful in penetrating the difficult tourism industry and supplying quality flowers around the country via courier. A cut flower retail price list from Tadra flowers is provided in table 11. There is a significant price differential between the summer (Dec – April) and winter (May – Nov) stock, reflecting the relative scarcity of flowers during the winter period.

Figure 21: Tadra Flowers Nadi outlet

Table 11: Tadra Flowers – retail cut flower price list (June 2007)

		SUMMER (DEC-APR)	VIP (12.5percent)	WINTER (MAY-NOV)	VIP (12.5percent)
ORCHIDS	*Small*	$ 2.50	$ 2.81	$ 3.50	$ 3.94
	Medium	$ 3.50	$ 3.94	$ 5.00	$ 5.63
	Large	$ 4.50	$ 5.06	$ 6.00	$ 6.75
ANTHURIUMS	*Small*	$ 2.50	$ 2.81	$ 3.50	$ 3.94
	Medium	$ 3.50	$ 3.94	$ 5.00	$ 5.63
	Large	$ 4.50	$ 5.06	$ 6.00	$ 6.75
GIANTS		$ 5.00	$ 5.63	$ 7.00	$ 7.88
PARROTS		$ 0.75	$ 0.84	$ 1.00	$ 1.13
HELICONIAS		$ 0.50	$ 0.56	$ 0.75	$ 0.84
GINGERS	*Small*	$ 2.00	$ 2.25	$ 2.50	$ 2.81
	Medium	$ 2.50	$ 2.81	$ 3.00	$ 3.38
	Large	$ 3.00	$ 3.38	$ 3.50	$ 3.94
LEAVES	*Small*	$ 0.50	$ 0.56	$ 1.00	$ 1.13
	Medium	$ 0.50	$ 0.56	$ 1.00	$ 1.13
	Large	$ 1.00	$ 1.13	$ 1.50	$ 1.69
FERN		$ 0.75	$ 0.84	$ 1.50	$ 1.69
PALM LEAVES		$ 1.50	$ 1.69	$ 2.00	$ 2.25
COCONUT FRONDS		$ 15.00	$ 16.88	$ 15.00	$ 16.88

Roi Ltd. has recently entered into a partnership with Fiji's largest supermarket chain, Morris Hedstrom (MH) to open flower outlets in several of their stores. Most recently, Roi Ltd. has introduced their 'Express flowers' into MH stores across the country, allowing customers to buy ready-made bouquets at convenient locations. This sort of marketing is growing the 'flower culture' in Fiji and helping to overcome the mentality that flowers are not something you have to pay money for.

In addition there are now over 50 informal flower-arranging businesses operating out of homes. Most these are part time businesses. However, they all have access to the SSO wholesale market provided they maintain a standing order. A notable feature of the florist flower arranging segment of the industry over the last few years has been the entry of micro enterprises operated by indigenous Fijian women. These florists have high artistic skill levels, with many benefiting from various flower arranging courses provided over the years.

The growth in the small florist and flower arranging segment has been made possible by the creation of a wholesale market and the availability of micro financing. A florist or flower arranging business, unlike flower growing, is well suited to micro finance. Capital start-up costs are relatively low and there is a short lag between expenditure of cash and receipt of

income. As such, these enterprises if well managed, can absorb the high interest rate charges associated with micro finance. Many of these micro enterprises minimise their costs by operating out of their own homes and sourcing their foliage (ferns, vasili leaves, and gardenia) leaves and some of their cut flower (certain ginger and heliconias) requirements around their homes. Customers now demand the inclusion of anthuriums and orchids which require greater capital investment to grow. These are mainly sourced through the SSO wholesale markets.

Income earned by small florists

With minimal overheads, these micro enterprises can earn a worthwhile return on their skill and endeavours. The returns from a standard bouquet are presented in table 12 below. The estimated cash expenditure for a medium bouquet is approximately $20. This bouquet can be sold for $45, yielding a gross margin of around $25. The time input is likely to be less than 1 hour for a skill flower arranger – although some time needs to be allowed for marketing. The average small florist would expect to sell 10 medium wreaths and 10 medium bouquets in a week. The total gross margin generated would be $440. If the florist operates out of a shop, overhead costs, such as rent and utilities, would have to be subtracted. A small florist might typically pay around $125 for these. It is not expected that the small florist would hire paid labour. Typically, several micro enterprises combine to share space and to ensure the shop is always manned by one of the owner operators.

Table 12: The estimated gross margin from a standard bouquet.

Retail price	**45**
Costs	
Materials	
Plain paper (1 sheet @18c)	0.18
Ribbon	0.25
1 metre cellophane	0.55
Card	0.05
Sub-total	**1.03**
Flowers	
Orchids	
3 large sprays(@ $1.78 each incl. Courier	5.34
5 medium sprays @ 1.48 each	7.40
3 small spay @ $.73 each	2.19
Anthuriums	
2 large	1.80
3 medium	2.10
Sub-total	**18.83**
Total cost	**19.86**
Gross margin from the bouquet	**25.14**

The apparent profitability in small florist operations is reflected in the low attrition rate amongst florists and flower arrangers buying from SSO. In 2001, when the SSO wholesale market began, there were 40 florists and flower arrangers buying on a regular basis. This number now stands at 51. All of the major florists have remained in business since the establishment of the wholesale market. The small flower arranging businesses that make up the majority of the wholesale buyers primarily operate their business from home, and therefore have very low overheads While it is common for some of these businesses to go ‘dormant’ for a period, most remain sporadic customers of the wholesale market. This rate attrition is much lower that might be expected for small and micro

business generally.[11] The performance is even more impressive, considering difficult political and economic climate that has prevailed in recent years. These results are testimony to the success of the orderly marketing system that has been put in place. The development of a wholesale market for orchids and anthuriums has facilitated new entry into this business that would not have otherwise been possible. However, the demand for flowers and flower arrangements tends to be erratic, often driven by unpredictable events such as deaths. Further growth in the wholesale market can be expected to reduce this risk somewhat. Growth in the number of florists can be expected with an upturn in the economy and with the increasing availability of flowers. This is a situation where supply driven demand – where the regular availability of flowers creates demand for flowers.

Exports and Exporters

Floriculture exports from Fiji are small and declining (Table 13). In 2005, exports of floriculture products totalled only FJD 14,277. These exports consisted primarily of heliconia cut flowers and cut foliage (croton and cordyline). While there have been two companies intermittedley sending shipments to New Zealand, these shipments have been minimal.

Table 13: Fiji floriculture exports 2001-2005

Commodity	2001	2002	2003	2004	2005
Cut flowers and flower buds, fresh	32,714	15,851	29,787	14,731	11,880
Other cut flowers and flower buds		2,358	4,106	125	
Bulbs, tubers, tuberous roots, corms, crowns and rhizomes	8		1,430		671
Other foliage, branches and other parts of plants	5,571	11,033	11,210	265	1,387
Other foliage, branches and other parts of plants, fresh		812	13,472	1,321	339
Other live plants, cuttings and slips		3,029	5,553		
Other live plants, un-rooted cutting and slips			6,000		
Total export	**38,293**	**33,083**	**71,558**	**16,442**	**14,277**

Fiji Islands Bureau of Statistics 2006

Imports and importers

Fiji floriculture imports, in contrast to exports, are significant and have been increasing (table 14 and figure 22.) Tables 15 and 16 contain a detailed list of cut flowers and live plants imported in 2005 and 2006. Table 15 lists all cut flower imports, quantity, and country of origin for all flowers imported in 2006 with a FQIS permit. This list was provided by Fiji Quarantine and Inspection Services (2007), as the body responsible for issuing permits to import. Many of the cut flower types listed are temperate flowers that can not be economically grown in Fiji. According to the data, nearly 6,000 rose stems were imported into Fiji in 2006. Roses convey a high level of prestige and strong growth in demand for these flowers is projected with the evolution of the Fiji flower culture. If a Fijian producer was able to produce cut roses of similar quality at a competitive price to those imported it can be assumed that these imports would decline and the producer would have no problem marketing their flowers to the domestic market.

Fiji's WTO obligations permit the imposition of a tariff of up to 40 percent on floriculture products. However, the actual tariff rate applied is only 3 percent. A study by the International Center for Trade and Sustainable Development (ICTSD) concluded that a much higher tariff rate was justified based on the floriculture industries potential contribution to rural development and livelihood security (ICTSD, 2006).

[11] *In the EU, for example, 30 percent of new micro enterprises (defined as 0 to 9 employees) start-ups do not survive beyond 3-years and 50 percent do not survive beyond 5-years (European Commission 2003)*

Table 14: Fiji floriculture imports 2001-2005

Commodity	2001	2002	2003	2004	2005
Bulbs, tubers, tuberous roots, corms, crowns and rhizomes		3,068	1,554	458	
Cut flowers and flower buds, fresh	14,151	19,182	40,986	84,263	34,081
Other cut flowers and flower buds			19,627	1,307	24,058
Other live plants, roses, grafted or not	3,006	9,214	10,778	2,107	
Other live plants, cuttings and slips	48,265	4,207	11,666	5,690	21,944
Other foliage, branches and other parts of plants		10,601	276	64	124,728
Total imports	**65,422**	**46,272**	**84,887**	**93,889**	**204,811**

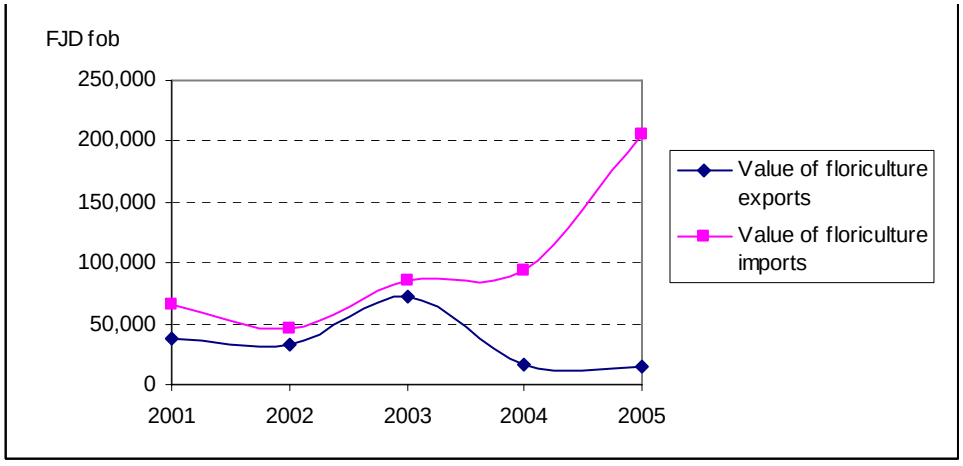
Source: Fiji Islands Bureau of Statistics 2006

Table 15: List of fresh cut flowers imported into Fiji – Year 2006

Cut flower type	Quantity	Country of origin
Roses	5984 Stems/Pcs	NZ, Japan, AUST
Orchids (cymbidium and others)	32 Boxes & 880 Stems	NZ, AUST
Gypsophilia	556 Bunches	NZ
Lilies	514 Stems	NZ, AUST
Carnations	1520 Stems	NZ, AUST
Chrysanthemum	1190 Stems	NZ
Liastrus	80 Stems	NZ
Caspea Blue	10 Bunches	NZ
Alstromeria	155 Bunches	NZ
Gerberas	200 Stems	NZ
Statice	10 Bunches	NZ
Iris	100	NZ
Freesias	150	NZ
Lisianthus	100	NZ
Ivy	65	NZ, Japan
Pazonia	3 Bunches	NZ
Baby's Breath	20 Stems	AUST
Anthurium	1 Box & 20 Stems	AUST
Green Berry	100 Pcs	JAPAN

Source: Fiji Quarantine and Inspection Services, 2007.

Figure 22: Fiji's floriculture exports compared with imports



5.1.4 Technology and skills

Research

Formal research in floriculture has been nearly non-existent in Fiji. This is due in part to the absence of floriculture in the curriculum at the Fiji College of Agriculture (FCA) and the University of the South Pacific (USP). When a commercial producer carries out research, this information generally remains with the producer and is not disseminated to the industry. On the quarantine side, a few research projects have been completed to facilitate the requirements of Fiji exporters. Most notable among these was the research conducted by Apaitia Macanawai (2005). Entitled, '*Devitalisation of Croton Stem* (*Codiaeum variegatum*),' in Fiji, this research identified the most effective and economical glyphosate rate for devitalising croton. This treatment was accepted by the New Zealand Quarantine service however it remains to be seen if exports of croton stems to NZ are viable. Jacqui Wright (2005) from SPC undertook work on nutritional problems, in particular potassium deficiency, associated with "red ginger decline". This work was never completed as a formal research project.

SSO conducts continuous investigations into suitable planting mediums for improved variety anthuriums in the varied climates around Fiji, utilising available raw materials. It was found that a suitable rice husk based planting medium used for anthuriums in the western Viti Levu was not as effective in the eastern anthurium growing areas. SSO documents well its production practices for anthuriums and orchids in order to train and equip its out growers.

A proposal to develop an Anthurium Research Project at USP was put to the university administration in 2005. This proposal was to develop a commercial anthurium production shadehouse at the USP College of Agriculture campus in Alafua, Samoa. The main focus was to research the most suitable planting medium, utilising available raw materials, for improved variety anthuriums in the geographic area surround Apia, Samoa. From this, it was intended that 'Ornamental Horticulture' would be introduced into the USP curriculum. Despite enthusiasm from the university administration, financial constraints meant that the proposal never eventuated. .

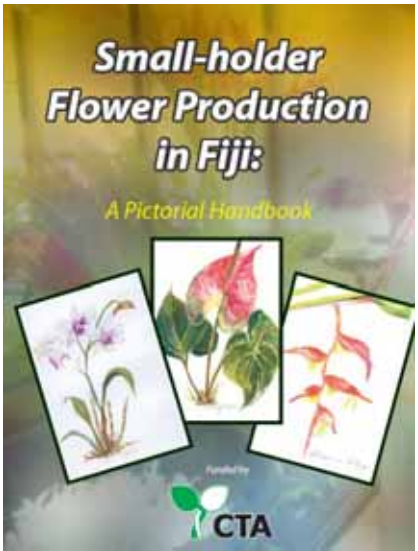
Extension

The Ministry of Agriculture does not provide extension services for floriculture. This is largely due to the lack of ornamental horticulture instruction on offer at the educational institutions producing the extension officers. At the Fiji College of Agriculture, only six classroom hours are set aside for floriculture instruction as part of a Crop Production class in the Tropical Agriculture diploma program.

Since 2001, SSO has attempted to provide good extension services to their out growers. However, limited resources and the broad geographic distribution of the growers prevent frequent site visits. SSO has recently (May 2007) received funding from AusAID for a full time extension officer to serve the new out growers in the poverty alleviation program at Koroipita. This valuable position will no doubt help improve the yields and quality of flowers from all the SSO out growers.

Training

Training in floral art and ornamental horticulture was previously provided through a sponsored position from the International Labour Organization (ILO). The late Jimmy Montu served in this position for a number of years in the 1990's. Once funding for this project ended, Jimmy continued training through local educational institutions. Illness forced him to stop teaching in 2000 and the classes stopped. These early courses were invaluable in developing the floriculture industry of Fiji.



Training material developed by SSO, with funding from CTA, has been the primary resource for numerous grower workshops. In April 2007, SSO published *Small Holder Flower Production in Fiji: a Pictorial Handbook*. With supporting posters this publication was used in a series of training workshops across Fiji. In August 2007, SSO published *Floriculture in Fiji as a Small and Micro Business*. Like the earlier publication, this handbook will serve as the basis for workshops to assist growers in the development of viable floriculture businesses.

5.1.5 Quarantine

The Fiji Floriculture Council's Strategic Plan (2000), identified quarantine related issues as one of the main constraints to the development of the floriculture industry. Subsequent surveys and stakeholder consultation for this scoping study confirmed this view. Stakeholders reported quarantine constraints related to the export of cut flowers and live plants, as well as imports of cut flowers and live plants. Some phytosanitary and quarantine problems can be attributed to the performance of the Fiji Quarantine and Inspection Service (FQIS). However, an abundance of misinformation and a lack of communication across all industry stakeholders compounds these difficulties.

FQIS plays a crucial role in the floriculture industry in a variety of capacities. It serves as protector of Fiji's relatively favourable pest and disease status; it provides growers access to new plant materials being developed all around the world; and it helps exporters' access markets for their products. A key requirement for the development of the industry is to improve the lines of communication between the Fiji Floriculture industry and the Quarantine Service.

A major boost towards resolving many of the quarantine related issues is provided by the *Survey of Agricultural Crops and Commodities Project, 2003*. This survey was instigated by the Ministry of Agriculture to assist Fiji's compliance with the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (AASPM). Under these arrangements, countries are required to justify their phytosanitary measures on the basis of pest risk analysis. A series of international standards for phytosanitary measures (ISPM) outlines the various procedures to be followed. A country exporting agricultural commodities is expected to be able to provide an importing country with an authenticated list of plant pests for that particular commodity.

To the benefit of the Fiji floriculture industry, four primary floral crops were included in this survey. These were orchids, anthuriums, gingers and heliconias. The surveys were carried out by Landcare Research, New Zealand, with Eco-Consult Pacific, Suva, in collaboration with Plant Protection Staff, Koronivia Research Station. This survey provides the basis for a pest risk analysis necessary for potential exporters of these crops. These surveys also provide Fiji Quarantine and Plant Protection the necessary information to make informed decisions on importation of cut flowers and live plants.

Imports of floriculture products

For all plant material, import approval must be given by FQIS. Under current arrangements, FQIS seeks the advice from the Plant Protection Section in the Ministry's Research Division to determine if the product is a risk to Fiji's ecology[12]. Risks analysed include insects, diseases, viruses and invasive species. Before a new plant product is imported, a complete list of pests and diseases affecting that plant in its country of origin must be supplied to Fiji Quarantine. This list is then compared to the list of pests and diseases already present in Fiji and a permit is either granted, with or without conditions,

[12] *Plant Protection's advisory role will end under the proposed corporatization of FQIS, under which FQIS is expected to have its own in-house plant protection capability. This is seen as a particularly retrograde development given Fiji scarce technical capability in the key area of plant protection and entomology.*

or denied. Once a product has been imported from a particular country, precedent has been set, allowing imports to continue, as long as all the conditions of approval are met.

Cut Flowers

Importers generally have little difficulty in securing permits for the importation of cut flowers. The risk concerns are minimal, as cut flowers cannot be propagated. The standard procedure is to inspect these flowers on arrival for live insects. Table 15 lists all cut flower imports, quantity, and country of origin for all products imported in 2006 with a FQIS permit. There are 19 different flower types listed – most of which are temperate flowers.

Live Plants

The importation of live plants is crucial to the development of an emerging floriculture industry. New varieties of plants are constantly being produced that have desirable traits for floriculture producers. Quarantine procedures for issuing import permits are often seen an unnecessarily rigid, inconsistent and often unreasonable. This in part explains the continued high incidence of plant smuggling, which puts the floriculture industry and other agriculture industries at considerable risk. Anecdotal evidence suggests that the main source of smuggling is from members of the floriculture industry themselves.

There are major inconsistencies in quarantine requirements and procedures for the commercial importation of floriculture planting material. For example, in 1997 a permit was issued to a Fiji company to import anthurium-planting material from the world's largest supplier based in Holland. The very strict and demanding protocol under which these plants were imported took nearly two years to negotiate. By contrast, anthurium plants from Australia can be imported into Fiji virtually without restrictions. It is the view of the Fiji industry that this imposes a far greater disease risk than imports from leading nurseries in Holland.

A list of live plants imported into Fiji between 2005-2006 is provided in Table 16 along with the approximate quantities and country of origin. This list suggests that a significant number of producers have invested the time and energy in going through the correct channels to import live plants.

Table 16: List of live plants imported into Fiji – 2005-2006

2005		
Floriculture product	**Quantity**	**Country of origin**
Roses – Bare Rooted Plants/ Cuttings	801	NZ, AUST
Gerberas – Bare Rooted Plants	56	AUST
Bromeliads Plants	5000	NZ
Anthurium Plants	7090	Holland, AUST, NZ
Orchids – Bare Rooted Plants	4086	Hawaii, AUST
Bougainville	20	AUST
Dahlia	70	NZ
Lilies	70	NZ, AUST
Xezorous	50	NZ
Xezaliya	50	NZ
2006		
Floriculture product	**Quantity**	**Country of origin**
Roses – Bare Rooted Plants/ Cuttings	80	NZ, AUST
Zebra – Bare Rooted Plants	20	NZ
Bromeliads Plants	6075	NZ, AUST
Orchids – Bare Rooted Plants	2200	AUST, Hawaii
Caladium Bulbs	5325	USA

Source: Fiji Quarantine and Inspection Services, 2007.

The procedures for importing a new plant or a plant from a new country of origin are provided in Table 17. Where appropriate, comments are made on these procedures in italics. The importation of dendrobium orchid plants from Thailand is used as an example for this process. This example is used as Thailand has become the major source of planting material for the Hawaii orchid industry and the Fiji industry has expressed interest in following this lead to remain competitive.

Table 17: Procedures for importation of live dendrobium orchid plants from Thailand

Step 1	Pest list for dendrobium orchids in Thailand must be sent from Thailand quarantine to Fiji Quarantine. *Often this will be the responsibility of the exporting nursery.*
Step 2	An official letter must be sent to Fiji Quarantine stating the intent of the importer. Fiji quarantine and the Plant Protection division must invest a considerable amount of time and energy into a pest risk analysis. As such, the applicant must clearly justify the importance of their application. Fiji Quarantine has been very clear that they do not facilitate the importation of plant materials for purely backyard use.
Step 3	The nursery in the exporting country must fulfil the 'good lab practices' criteria set out by plant protection. They may also be required to virus index the plants before they leave the country. A description of the facilities at the exporting nursery must be submitted to Fiji Quarantine along with contact information so that Fiji Quarantine or Plant Protection can contact the nursery directly. *It is in the best interest of the importer to deal with a reputable nursery that is willing to work with their local quarantine service as well as Fiji Quarantine to facilitate a successful export. For a nursery to invest in this process, they will require a sizable order or the guarantee of future orders.*
Step 4	Fiji Quarantine and Plant Protection will review the application and either issue a Permit to Import, with conditions, or deny the application.
Step 5	Arrangements must be made in the country of origin to obtain an export permit, phytosanitary certificate and all other necessary documentation.

If the plant has already been imported from the desired country of origin than a pest risk analysis has already been completed and conditions are in place and the process is greatly simplified. Therefore, producers are encouraged to know what plants have been approved from what country of origin and make decisions based upon this information. Quarantine and Plant Protection officials have expressed that the time and resources necessary to carry out a pest risk analysis are great and often not warranted for a backyard grower importing minimal amounts of plants. They therefore encourage such growers to stick with plants and countries of origin that already have a system in place. To make the current process more commercially viable for Fiji's small importers, FQIS is encouraged to utilise the precedents created by larger countries that are importing from the same source. For example, Fiji should be able to fast track Thailand and Singapore nurseries and laboratories that supply orchids to Hawaii.

Exports

FQIS plays a critical role in facilitating the development of the export markets for floriculture products. Fiji's cut flowers face less quarantine restrictions than other horticultural exports. However, there are quarantine difficulties with cut flower exports. The quarantine regulations for cut flowers into New Zealand and Australia often change, with the Fiji industry often not receiving notification of these changes. Such uncertainty poses a serious constraint to developing export businesses and exploiting the potentially lucrative tourist carry-on market.

The prohibition of dendrobium orchid cut flowers into New Zealand is indicative of the problems faced with quarantine administration. Prior to 1998, cut flower dendrobium orchids were allowed into New Zealand, subject to inspection and a valid phytosanitary certificate. However, in August 1998 cut flower orchids were no longer permitted into New Zealand. While Fiji Quarantine management was notified of the change, this information was not passed on the floriculture industry, or to the personnel issuing phytosanitary certificates at the airport. As a result, tourists who purchased orchids had their flower seized and the Fiji industry was discredited.

The loss of the New Zealand dendrobium orchid market came as a major surprise to the industry. Dendrobiums are the most widely traded tropical orchid. Prior to the prohibition being imposed, Fiji had been shipping these cut flowers to NZ for several decades. Over this period, there was no indication of Fiji having any disease or pest that would be of quarantine significance. In early 1998, New Zealand MAF (Quarantine) restructured its importation procedures for plant products. Approval for all products already permitted access to New Zealand would continue subject to a request from the quarantine authorities of the exporting country or a request from the New Zealand importers. At that time, Fiji anthuriums, heliconias, and gingers were being imported into New Zealand and the importers made necessary application for importation to continue. At the time, dendrobium orchids were not being imported and thus no application was made by a New Zealand importer. Unfortunately, Fiji Quarantine “failed to fill in the form” by the specified deadline and thus cut flower dendrobiums were excluded from the approved list. Cut flower dendrobium from Fiji are now considered as a new product in terms of phytosanitary market access into New Zealand As such, adding orchids to the permitted list will require the development of an “Import Health Standard” for orchids. Fiji will need to provide a list of pest/diseases associated with orchids for a pest risk assessment to be carried out. If this information is not available, then a survey will have to be undertaken on the basis of which a bilateral quarantine agreement (BQA) would need to be negotiated. No such BQA has been negotiated, despite the elapse of nearly 10-years and dendrobium orchids being included in the Landcare pest survey. Fiji’s cut flower dendrobium orchids are permitted access to Australia and to North American markets without quarantine treatment, subject to inspection on arrival.

5.1.6 CITES and Fiji’s ornamental horticulture industry

CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. Fiji and most other Pacific island countries are members of CITES.
CITES does not prohibit the international movement of genetic material, rather it is intended as a means of ensuring that the trade is formally administrated Under CITES, the transfer of genetic material for the purpose of research is actively encouraged. A fundamental problem for the Pacific islands, is the lack of technical expertise and understanding of plants on the part of administrators charged with formulating regulation In Fiji specifically, some of the domestic regulation made under CITES inhibits commercial development without achieving the desired conservation objectives. This impedes progress in developing sustainable trade in plant materials.

All of Fiji’s known indigenous plants belonging to the family Orchidaceae are covered by the provisions of CITES.13 None of these 26 orchid species are permitted to be shipped

[13] *The Fiji orchid species listed under CITES are:* ***Acanthephippium papuanum*** *Schltr.;* **Aglossorhyncha biflora** *J.J. Smith;* **Agrostophyllum megalurum** *Reichb.f. ;* **Bulbophyllum betchei** *F. Muell.;* **Bulbophyllum longiscapum** *Rolfe;* **Bulbophyllum pachyanthum** *Schltr.;* **Bulbophyllum samoanum** *Schltr.; Calanthe hololeuca Rchb.f.;* **Chrysoglossum vesicatum** *Reichb. f. ;* **Dendrobium biflorum** *(G. Forster) Sw. ;*

out of Fiji and heavy penalties apply. It is suspected that smuggling does occur, although there have been no prosecutions made under the CITES regulation.

CITES offers a commercial opportunity for Fiji's floriculture industries. These indigenous orchids could be propagated artificially under laboratory conditions from which F1 and F2 hybrids could be developed. Desirable hybrids could then be multiplied by commercial growers for sale to overseas buyers. These would be unique orchids certified under the provisions of CITES, which would give them a marketing advantage. The frequency of visits by Japanese orchid enthusiasts is a reflection of the potential market interest in such orchids.

With only 26 orchid species listed under CITES Fiji has a relatively narrow gene pool upon which to draw, compared with PNG or even the Solomon Islands. There may be scope for developing collaborative exchange programs with PNG and the Solomon Islands under the provisions of CITES. Mr. Marika Tuiwawa, Curator – Regional Herbarium, identified the potential as follows:

There is great potential for utilising some of the Pacific plant species in breeding programs to develop a hybrid product that is completely unique to the Pacific. Genetic material can be gathered from various Pacific countries and brought to one place under the umbrella of an organisation like SPC for the purpose of crossing these varieties to get a completely unique plant species. This hybrid species can then be distributed back to the Pacific Islands (most likely the floriculture circles) for mass propagation and distribution (export or otherwise) and the opportunity for income generation. The potential revenues from a unique Pacific orchid species are enormous. Once the hybrid gets more than two generations away from its original wild type, then it no longer comes under the CITES umbrella. The most obvious Pacific countries to collaborate on something like this are the Melanesian countries i.e. Vanuatu, Solomon Islands, and Fiji (Personal communication July 2007).

However, to achieve Tuiwawa's vision will require a coherent minor forest products policy in all three countries to encourage investment and sustainable commercial development.

It should also be noted that the Fiji indigenous orchid *Dendrobium tokai* was crossed with *D*. *phalaenopsis* (Cook Town Orchid) from Queensland Australia to develop the first University of Hawaii hybrid.

Despite the significant opportunity that CITES offers Fiji's floriculture industry, the inappropriate application of the Convention by Fiji's Department of the Environment has been detrimental to the industry. A leading orchid producer had the opportunity to export hybrid orchid plants to another Pacific island country. The orchid plants were hybrid dendrobiums bred by the University of Hawaii and imported into Fiji. The producer was ultimately required to pay a FJD1,000 annual CITES Registration Fee plus FJD 30 on each transaction. Despite attempts to have these fees waivered, on the grounds that the plants were not endangered species nor produced in Fiji, the producer was denied and subsequently abandoned efforts to facilitate the transfer of materials. The industry's concern on the matter is summed up in the following expert of a letter to the CITES Management Authority in 2005:

Re: CITES Registration Fee for the sale of hybrid orchid plants.

- South Sea Orchids (SSO) currently operates a small project involving some thirty women dendrobium orchid growers – ranging in size from 200 to 6,000 flowering plants. Many of our growers are village women. SSO provides these growers with plants, a market outlet and technical support services for these growers. The orchid's plants were sourced from Hawaii and are all hybrids bred in the University of Hawaii laboratories. These orchid plants are imported in community pots
- We have been informed by Dr Dick Watling that the CITES Convention covers trade in such orchids, even though they are hybrids and are not sourced from the wild. We have been informed that under Fiji's Endangered and Protected Species Act 2002, to trade in these orchids requires an annual fee of $1,000 plus a $30 payment for each transaction. I am sure SSO's operation was not the type of business the drafters of the legislation had in mind. We regard the imposition of this fee as punitive and would be a serious blow to commercial viability of Fiji's embryonic floriculture industry for reasons that have nothing to do with endangered species. Therefore we respectively request that these fees be waivered for SSO and our Project members when we buy and sell our hybrid dendrobium orchid plants.

5.1.7 Institutional arrangements

Industry groups and associations

A feature of the Fiji floriculture industry is the numerous support groups and associations. These include:

- SSO Floriculture Project
- Suva Orchid and Horticulture Circle
- Note Horticulture Women's Group
- Davuilevu Floriculture Group
- Tebara Greenfingers Group
- Fiji Cut Flowers and Growers Association
- Suva Cut Flowers Association
- Nakasi Cut Flowers Association
- Passionate Blooms
- Tailevu Evergreen

The SSO Floriculture Project with its 70 out growers has been instrumental in developing the industry into what it is today. SSO provides the market outlet, technical support and sometimes financing to its small growers and also imports planting material on their behalf. With the large supply of flowers provided by its growers, SSO now has the capability to confidently market to local florists and resorts. When the opportunity arises, SSO is also poised to enter the export market.

The Suva Orchid and Horticulture Circle (SOHC) is a servicing group that has been in existence since 1953. There are currently 300 active members. SOHC offers a range of classes in floral art and holds meetings once a month with guest speakers. The SOHC holds local annual flower shows and also sends members to the Auckland flower show to compete.

Fiji Floriculture Industry Council

In the late 1990s, the Fiji government embarked on a policy to establish industry councils as a mechanism to promote private sector development of the agricultural sector. During this period Industry Councils were established for ginger, root crops, kava, dairying and floriculture. None of these Councils proved to be sustainable, beyond the initial establishment grants provided by government.

The Fiji Floriculture Council (FFC) was established in early 1999. The United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) provided technical assistance to the newly formed Floriculture Council in the preparation of a Strategic Plan for the Council. This Strategic Plan was endorsed by a General Meeting of the FFC in May 2000 (ESCAP, 2000). The Vision, Mission and Underlying Philosophy of the Council were enunciated as follows:

- Industry Vision: A competitive world-class floriculture industry that contributes substantially to the prosperity of the people of Fiji.
- Council Mission: To provide sound industry leadership in the areas of policy formulation, dealing with government and other agencies, education and information, setting standards, and promotion.
- Underlying Philosophy: The individual stakeholders (flower growers, nurseries, wholesalers, florists, and exporters) are the driving force of the industry - the role of the Council being only to facilitate the prosperity of these stakeholders for the common good of the Fiji floriculture industry.

(ESCAP 2000)

The FFC had as its 10 specific goals:

1. Creating a “flower culture” within the tourism sector
2. Fiji becoming a major exporter of floriculture products
3. Increasing income earning opportunities from floriculture
4. Enhancing skill levels and professional standards in the industry
5. Increasing the flow of information to the industry
6. Improving the quality of floriculture products sold on domestic and export markets
7. Improving quarantine arrangements for imports and exports
8. Advising and coordinating new starters in the industry to minimize failures
9. Achieving independence and increasing financial self reliance of the FFC
10. Securing technical and other assistance for the industry

(ESCAP 2000)

The adoption of the FFC Strategic Plan coincided with the 2000 Coup. As such, political uncertainty and a depressed economy stifled the formation of the FFC . The initial seed money promised by government to finance the establishment of the FFC was not forthcoming. The intention was to obtain EU support to fund the position of CEO of the FFC for an initial period of 3-years. Such a request failed to materialise. The foundation Board of the FFC was predominantly people with commercial involvement in the floriculture or associated industries. Their orientation was in keeping with the industry goals that constituted the Strategic Plan. In 2002 a new FFC Board was elected, dominated by people with a hobbyist orientation to floriculture. This Board was unable to move forward the ambitious floriculture agenda that was the Strategic Plan.

The FFC, as with the other Industry Councils, has become moribund with meetings no longer held. However, the FFC does provide an institutional framework that could be utilised to move the industry forward toward achieving the vision of having “a competitive

world-class floriculture industry that contributes substantially to the prosperity of the people of Fiji". There remains scope for the revitalisation of the FFC along the lines that was envisaged in the 2000 Strategic Plan. The Vision, Mission and Philosophy, together with the 10 strategic goals listed above provide a framework for analysing the opportunities, constraints and requirements for the development of Fiji floriculture industry.

5.1.8 Economic contribution of the ornamental horticulture industry

The overall economic contribution of the Fiji floriculture industry is small. The annual contribution of the floriculture industry to Fiji's Gross Domestic Product is estimated to be only around $1.4 million – measured in terms of value added (table 18). However, this is a highly labour intensive industry and generates the equivalent of one full time job equivalent for every $2,800 of value added that is created.

Table 18: The estimated economic contribution of the Fiji ornamental horticulture industry

	annual valued added (FJD)	annual employment (full time job equiv.)
Production		
Cut flower growing		
Dendrobium orchids		
- SSO	163,000	3
- Outgrowers	73,000	38
Anthuriums		
- SSO	22,000	2
- Outgrowers	33,000	50
Gingers/heliconias		
- Growers	20,000	30
- hotels and resorts	10,000	10
Potted plants and trees	321,000	
- Growers	200,000	250
- hotels and resorts	40,000	10
Sub-total	882,000	393
Marketing and Distribution		
cutflower wholesale marketing	150,000	4
exporting	10,000	2
potted plants and trees	100,000	20
florists/flower arranging	250,000	75
Sub-total	510,000	101
Total	**$ 1,392,000**	**494**

In 2006 the International Centre for Trade and Sustainable Development undertook a Fiji case study of "Special Products and Special Safeguard Mechanisms" for the WTO Doha Round. It recommended that floriculture be nominated as a "Special Product" for tariff protection. This recommendation was based on the industries potential contribution to rural development and livelihood security. The study concluded:

- Floriculture is a labour intensive activity that mainly involves women. It is currently focused in Viti Levu. There is scope to expand floriculture to the outer island floriculture centers of Taveuni and Vanua Levu (p, 75).

5.2 A competitive world class floriculture industry that contributes substantially to the prosperity of the people of Fiji: a realistic vision or an improbable dream

In its Strategic Plan of 2000, the Fiji Floriculture Industry had as it's vision: "A competitive world class floriculture industry that contributes substantially to the prosperity of people". An industry that contributes only $1.4 million to GDP and employs around 500 people is a long way from achieving that vision.

The ambitious vision of the Fiji floriculture industry is based on the following factors:

- climatic conditions favourable for growing a wide range of tropical flowers and ornamentals
- a relatively favourable pest and disease status compared with other producing areas
- a nascent production and marketing structure already in place
- a substantial, yet under-supplied tourist based market
- a strong non-tourist local market, with the increasing availability of floriculture products generating its own demand
- a strategic location with respect to Pacific Rim markets (New Zealand, Australia, Japan, and off-season Hawaii)
- competitive labour costs compared with most other competing producing area
- good air and air freight linkages.

Each of these factors is evaluated briefly in turn below.

5.2.1 The tropical flowers and ornamentals suited to Fiji's climatic conditions

Due to Fiji's geographic latitude and topography, it is essentially confined to the growing of tropical flowers. The Nausori Highlands located in western Viti Levu does offer suitable conditions for temperate flowers. However, in comparison to highland floriculture locations in East Africa, Central America and South East Asia this is a small area that is less than optimum in terms of altitude. The Highlands of Papua New Guinea, in contrast, compares most favourably in terms of climatic conditions.

The three main existing growing areas (Suva, Nadi and Labasa) have a temperature range of 20.9 - 31.3 degrees Celsius, annual rainfall range of 1686.8 – 3355.9 mm, and total hours sunshine range of 1911.5 – 2555.9 (Table 19).

Table 19: The prevailing agronomic conditions for Fiji three main ornamental horticulture areas

Rainfall and sunshine data - 2005

	Rainfall [mm]			Total Hours of Sunshine		
	Suva	Nadi	Labasa	Suva	Nadi	Labasa
Total	3355.9	1686.8	1876.2	1911.5	2555.9	2207.3

Temperature data - 2005

	Maximum °C			Minimum °C		
	Suva	Nadi	Labasa	Suva	Nadi	Labasa
Total average	29.6	30.2	31.3	23.1	21.5	20.9

Source: Fiji Islands Bureau of Statistics, 2007.

These climatic conditions have favoured the production of tropical cut flower types; dendrobium orchids, anthuriums, gingers and heliconias. However, there is a wide variety of other potted plants and foliage that are very well suited to Fiji's climate however they have not been exploited commercially.

The frequency of tropical cyclones is a major negative climatic factor that has constrained investment in ornamental floriculture. In a report "Disasters and Agriculture in the Pacific Islands" funded by the UN Department for Economic and Social Affairs (September 1999), it was reported that the Fiji group recorded 136 cyclones between 1880 and 1997. Depending on the magnitude of the storm varying levels of damage to land and crops can be expected. Extremely high levels of rainfall associated with tropical cyclone can cause flooding and loss of soil and vegetation.

The suitability or otherwise of climatic conditions for Fiji's present and potential ornamental crops are discussed in greater detail in Table 20.

Table 20: The suitability of Fiji's climatic conditions for selected floriculture products

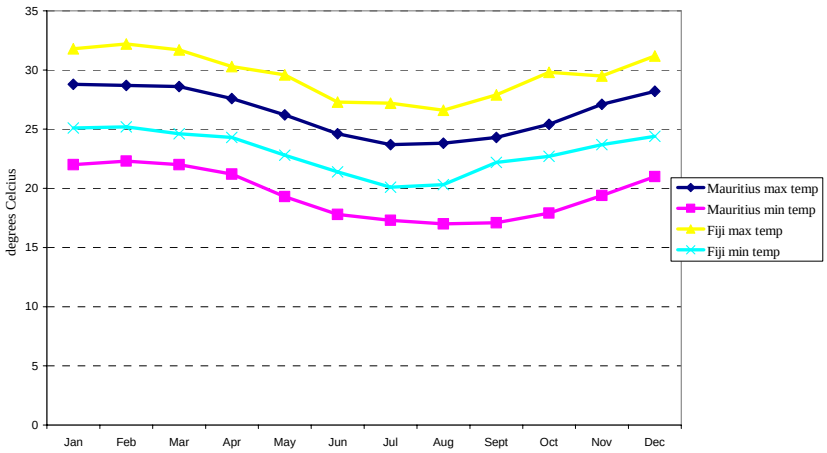
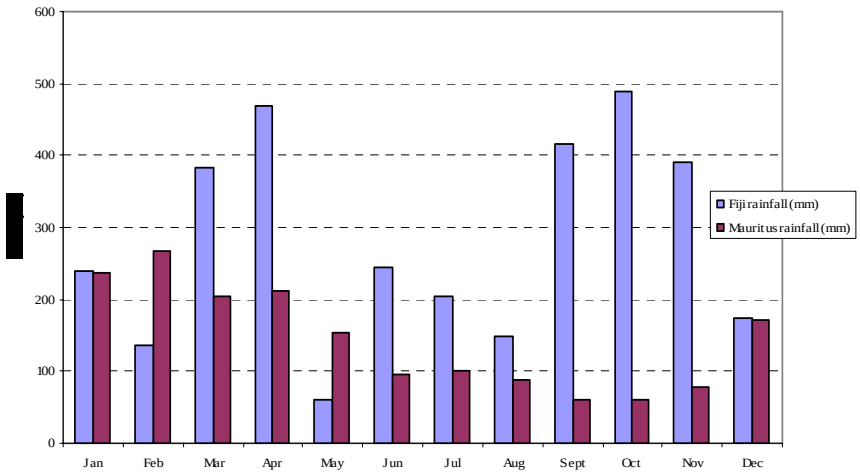
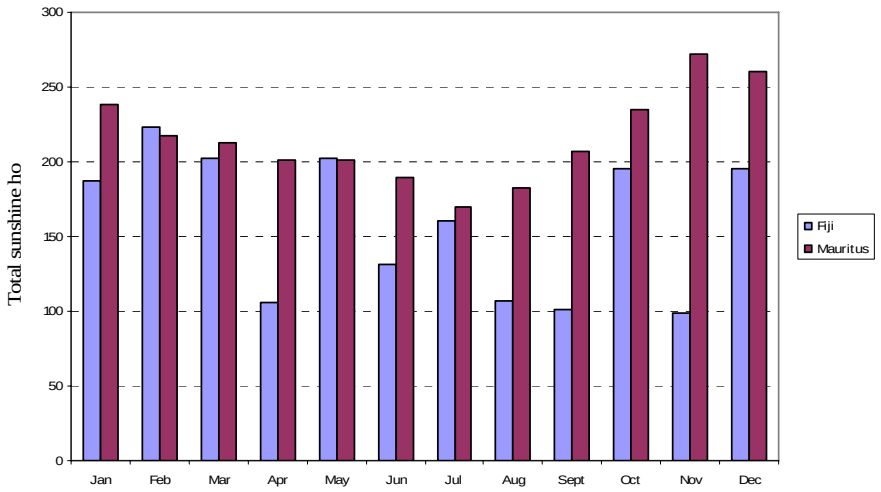
Floriculture product	Fiji's relative climatic conditions
Anthuriums	Anthuriums are native to the rain forests of South America. Thus they are well suited to the hot humid conditions along the coastal areas of Eastern Viti Levu (Suva/Nausori/Navua). They will grow well in Western Viti Levu. However, moist conditions have to be created by misting sprinklers. The temperature range for anthuriums is between 14oC and 35oC, with an optimum day time temperature of about 22oC. The upper limit of the acceptable temperature range depends on humidity. Good flowering requires high humidity. In the high humidity conditions of the Suva area, anthuriums would thrive at 35oC. In the lower humidity conditions of Nadi, anthuriums will feel distinctly uncomfortable at this temperature. Thus measures would be needed to either reduce the temperature or increase the humidity. Anthuriums need semi shade conditions. Too much light can cause the colours to fade. If there is little or no shade the leaf temperature will be well above the air temperature causing the leaf to burn and plant growth to be slowed. The climatic conditions of the Suva area are compared below with those of the Mauritius growing anthurium growing region (Figure 21, 22, 23). Mauritius is the world's largest anthurium exporter located in the tropics. **Figure 21: Average monthly temperature comparison**  *Source: Fiji Meteorological Service, 2007* *Mauritius Meteorological Service, 2007* The range between daily maximum and minimum temperatures is about the same for Mauritius and Fiji. However, the average daily temperature for Mauritius is about 3o C lower than for Fiji and could be regarded as more favourable than Fiji for anthuriums. **Figure 22: Average monthly rainfall comparison**  *Source: Fiji Meteorological Service, 2007* *Mauritius Meteorological Service, 2007*

Figure 23: Average total sunshine hours by month (country comparison)



Source: Fiji Meteorological Service, 2007
Mauritius Meteorological Service, 2007

In the Suva area, overall annual rainfall is higher than that of the Mauritius wet zone and displays considerably more seasonal variation. Similarly Suva's hours of sunshine are somewhat less than that of Mauritius. Overall rainfall/humidity conditions in both locations can be regarded as optimum for anthuriums.

The decline in anthurium production during the winter months of May through August is not particularly marked in Fiji and is significantly less than that experienced in Hawaii. It has been suggested that the winter window offers a market for anthuriums in New Zealand when there is a shortage of locally grown flowers. Despite this opportunity, landed prices of air freighted anthuriums are still not sufficiently low to compete with local hot-house production or imports from Mauritius via Singapore. A larger scale producer may be in a position to take advantage of such seasonal niches. In the mid-1980's, a large Hawaii based anthurium producer, faced with anthurium blight, considered investing in large scale anthurium production in Fiji based on the perceived advantage of Fiji geographic location. The company's business plan noted:

Fiji's ideal southern hemisphere location will assure that flowers will be available for the European, North American and Asian market's winter demand when prices are high. (This is also when Hawaii's and Netherlands' production are lowest). Fiji's relatively low labour and energy costs will also allow the flowers to be sold at very competitive prices.

Orchids
-dendrobium

The conditions required for optimum dendrobium orchid production are:

- bright sunshine a high percentage of the time
- good drainage – native epiphytes in trees dry out within 15 minutes of rain
- warm day temperatures (between 24^{o}C and 30 ^{o} C with night-time lows not falling below 18 ^{o} C
- low to moderate rainfall not exceeding 10cm monthly
- good air movement but without regular strong winds
- a level site with good drainage.

These conditions are largely met in orchid growing areas around Nadi. SSO and some of the better out growers achieve yields comparable to that of Hawaii's growers. In contrast, the production level of dendrobium growers in the Suva area is less than half that achieved by their Nadi counterparts. Dendrobium production in both Fiji and Hawaii experiences considerable seasonal variation, with around a 50 percent reduction in yield experienced during the winter months (May through August in Fiji). This explains the continued interest from Hawaii in importing orchids from Fiji. In Hawaii, December and January also happen to be the peak demand period, with tourist arrivals at their highest. Thus, there is shortage of orchids in Hawaii during this period which coincides with Fiji's peak production period. Low cost orchids from Thailand and Singapore largely fill this gap. However, there remains a

	niche market for the *Uniwai* series of dendrobiums developed by the University of Hawaii that are grown in Fiji (see annex 2). However, to exploit this market, growers would have to accept significantly lower prices than they obtain selling locally. New Zealand has a winter window (May to August) when there is a shortage of locally grown flowers. New Zealand winter window also happens to be the low period of availability from Fiji. All of New Zealand's dendrobiums are currently sourced from Singapore, with quarantine restrictions precluding the import of Fiji orchids. Turners and Growers, the main flower importer reports: "the quality, length, colour and cleanliness of Singapore orchids are far better than those that were imported from Fiji in the past" (PITIC, 2006). Furthermore, the price received by Fiji growers is about comparable to the fob price received for Singapore orchids.
- oncidium	The most common of the Oncidiums are suited to warm humid conditions commonly found at low elevations along the coast. These orchids are not as particular as the dendrobiums with respect to light conditions, humidity etc., and thus can be grown in most regions of Fiji.
-vandas	The majority of orchids that fall in this category originated in the monsoon regions of tropical Asia. Therefore, they require the warm moist conditions found in the Central and Eastern parts of Viti Levu. These orchids require full sun and good aeration on their roots. It is recommended that vandas be the potted orchid of choice in the wet regions of Fiji.
-phalaenopsis	Phalaenopsis orchids are suited to warm, humid areas with abundant moisture. Since all Phalaenopsis are natives to tropical rain forest areas, they enjoy a year-round high temperature which can vary from 16 ^{o}C at night to 32 ^{o}C in the day. Flowering is enhanced in the 16-19 degrees Celsius range in the winter, therefore, growers at higher elevations generally have more prolific flowering plants that those at lower elevations. They require more shade than the dendrobiums but are not as susceptible to rots and fungal diseases.
Gingers and heliconias	Gingers and heliconias require hot, wet conditions to flourish. Thus they do best in the Central and Eastern parts of Viti Levu. To grow gingers and heliconias commercially in the dry zone requires irrigation. These plants like lots of water and well-drained soils rich in organic matter. However, they do not like "getting their feet wet" and thus do not grow well in standing water. The minimum temperature must exceed 5 ^{o}C, which is not a constraint in Fiji. Where temperatures are not limiting, flowering is year-round if moisture and nutrition are adequate.
Various leaves and ferns	The eastern parts of Viti Levu with an average rainfall of 3,360 mm per year and average temperature range of 23-29 ^{o}C provides ideal growing conditions for a variety of leaves and ferns. The Central Division of Fiji with its higher altitude and high rainfall boasts an expanse of forests that is home to a wide variety of leaves and ferns. Of potential commercial importance is the maile plant which is a vine-like shrub woven into garlands. Maile is greatly revered in Hawaiian culture and is in high demand. With local resources having become scarce in recent years, maile has been actively sourced from other Pacific Islands. The Cook Islands has been supplying Hawaii with Maile for the last 14 years. Trial shipments of Fijian maile sent in 1998 were not up to standard for a variety of reason. However, the importer is still eager to carry out more trials. Croton is a common used garden plant. It propagates easily from cuttings and is tolerant of many types of soil. In the wet Central and Eastern parts of Fiji, this plant thrives with little or no assistance.
Potted Plants	Climatic conditions in all growing areas of Fiji are suitable for a variety of potted plants. Partial shade supplied by sarlon cloth is used in commercial nurseries while the majority of potted plant producers grow under trees and around their compound.
Palms	A wide variety of exotic palms are grown in Fiji and almost all are well suited to local climatic conditions found, provided they are planted in the correct media. Commercial palm nurseries often benefit from the high rainfall in the Eastern and Southern parts of the islands as this reduces the amount of hand watering.
Roses	While there is potential for commercially growing roses in the western parts of Fiji, it is assumed that due to the hot and moist conditions found in almost all feasible growing areas there will be substantial constraints to high quality production. Both daytime and night time temperatures are 5-7 degrees Celsius higher than ideal. The conditions in the Nausori Highland meet these minimum temperature requirements. During the wet season, the hot and humid weather may result in higher than usual downey mildew pressure. Air circulation fans and selecting varieties with some downey tolerance will help to combat this pressure.

Climate change and the Fiji floriculture industry

The negative impact of Fiji's relatively high frequency of cyclones on the floriculture industry is discussed above. The expectation is that with global warming, the frequency and severity of cyclones will increase.

On the positive side, climate change has the potential of having positive impacts on the international competitiveness and markets for Fijian floriculture products. Australia is experiencing its worse drought in 115 years, with an estimated loss of AUD8.1 billion in lost farm production (Environment News Service date). The availability and cost of irrigation water is starting to impact significantly on most horticultural crops including ornamentals The Australian drought has already been a major factor in the sustained increase in demand for Fijian papaya on the Australian market over the last few years. A few years ago, Fijian papaya was not deemed to be competitive in Australia apart from during a narrow winter window (Natures Way Cooperative 2001). It is now exported year round, with the binding constraint being supply. Fiji's ornamental horticultural products could potentially face similar structural demand changes in the future.

Overall conclusion:

Fiji offers generally good climatic conditions for growing tropical flowers. However, unlike the Highlands of Papua New Guinea, Fiji does not offer any significant advantages in terms of climatic conditions.

5.2.2 A relatively favourable pest and disease status compared with other producing areas

Fiji's pest and disease status for ornamental floriculture is considered relatively favourable compared to many other producing areas. As a result of recent pest and disease surveys, there are now recorded pest lists of some of Fiji's floriculture crops (*Survey of Agricultural Crops and Commodities Project* 2003), Notably absent from Fiji are giant African snail (*Achatina fulica*)[14] a devastating pest for ornamentals and the anthurium bacterial blight, that decimated the Hawaii anthurium industry in the 1980s[15]. Fiji's pest and disease status for various ornamental products is discussed briefly below.

[14] *The giant African snail is now present in over 11 pacific islands countries and is of particular concern due to the wide range of crop and ornamental plants it feeds on. Despite several discoveries of giant African snail at ports of entry in Fiji, there has been no African snail break outs. Most recently A. fulica was detected most recently in Upolu Samoa towards the end of 1995 and in Tuvalu in May 1996. The main mode of dispersal of the giant African snail within the region is believed to be via imported second-hand goods such as vehicles and machinery that carry the snail unknowingly. So far, there are no biological control agents effective against the giant African snail. Predatory snails were introduced to some areas but they were found to destroy populations of harmless indigenous snails.*

[15] *As the result of anthurium bacterial blight production Hawaii's production dropped from a record high of approximately 30 million stems in 1980 to 15.6 million stems in 1990. Hawaii exported over 5.5 million anthurium stems to Japan and commanded a 98percent market share. In two years these exports fell to 2.5 million stems, with some market share being taken by other producers such as Mauritius. Following implementation of an integrated disease management program, annual production losses were eventually reduced to 5percent or less. However, due to the high cost of disease management, a few large farms now dominate the commercial markets (Alvarez et al., 2006).*

Anthuriums

A major advantage for Fiji is that it that it is free of anthurium bacterial blight (Figure 26). This was confirmed in a recent Survey of Agricultural Crops and Commodities Project, 2003. The survey reports:

"Bacterial blight of anthurium which was a threat to the ornamental industry in Hawaii in the 1980's and 1990's has not been found in nurseries around Nadi and elsewhere, but this fortunate situation should be viewed with caution and active surveillance continued. In Hawaii the disease was first reported in 1971 but did not become of significance until almost one decade later. In the Fiji Islands there may be some unregulated traffic in propagating material leading to introduction of the disease. Unlike mango, cassava, and ginger anthurium is grown in isolated and relatively contained environments. The disease is likely to spread in an insidious manner and be more difficult to recognise" (McKenzie et al., 2003).

Figure 26: Anthurium bacterial blight

Source: humanflowerproject.com

Once introduced into a new growing area, this disease can result in a 50 to 100 percent loss of plants (Alvarez et al., 2006). While the impact of this disease has been greatest in Hawaii, it has been reported through much of the anthurium growing world. This disease has been reported in the Philippines, Guam, Australia, Florida, Jamaica, Puerto Rico, Martinique, Venezuela and Trinidad and more recently in India and the Netherlands (Alvarez et al., 2006). The introduction of this disease into Fiji would be of concern not only for anthuriums. Bacterial blight affects most genera and species in the family Araceae, which including taro. It was the absence of bacterial blight in Fiji that encouraged Hawaiian Heart, a large Hawaii anthurium exporter, to consider moving operations to Fiji in the late 1980s to enable it to continue to supply the short fall in the Japanese market.[16]

Annex 1 provides a list of pest and diseases found on anthuriums in Fiji by the *Survey of Agricultural Crops and Commodities Project,* 2003. Fiji's pests and diseases list for anthuriums is compared with Hawaii's *Pest and Disease List* provided by the University of Hawaii, 2006. This comparison shows only 10 insect pest species found on anthuriums compared to Hawaii's 15 species. Similarly, only five disease pathogens were found associated with anthuriums in Fiji compared to 13 in Hawaii (Annex 1).

[16] *The Hawaiian Heart proposal was to invest in a 30 acre (under shade) anthurium facility at Navua. A feasibility study was undertaken, identifying Fiji's strong comparative advantage to Hawaii, in terms of labour costs, growing conditions and peak summer production period. Despite this, the venture did not proceed.*

Orchids

Fiji has a range of indigenous orchid species as well as commercial varieties. Orchids are prized in Fiji and in the 1960's, were the first floriculture crop to be developed commercially. Not surprisingly, Fiji has a relatively large number of orchid pests and diseases. However a recent survey (*Survey of Agricultural Crops and Commodities Project,* 2003) found that Fiji had only a fraction of the orchid pests found worldwide. Annex 1 compares Fiji's orchid pest and disease list with that of Hawaii. Fiji recorded only eight insect pest species compared to Hawaii's 30 species. According to the survey report, two agents of bacterial brown spot of *Cymbidium* orchid were identified at one location in Fiji for the first time. To combat bacterial and fungal diseases, the majority of orchid growers have set up operations in the drier western regions of Fiji. The small-scale grower system helps protect against major pest and disease outbreaks which can cause large economic losses as was seen with Hawaii dendrobiums in the late 1980's. Today, bacterial diseases are found in all orchid production areas in Hawaii and have become a serious threat to the industry.

Dendrobiums are the major orchid crop in Fiji. The most serious insect pest affecting Fiji's dendrobiums is the orchid weevil borer (Figure 26). Virus, fungal and bacterial diseases are also associated with dendrobiums. Viruses are also a serious threat to orchid production in Fiji, with three locally identified viruses affecting orchids[17]. Once a plant is infected by a virus it cannot be cured, even with chemicals. The main means of virus spread is mechanical, via secateurs, clippers or via sucking pests. Fiji orchid growers all harvest spikes by breaking them off by hand and not using clippers. This is seen as the primary means of controlling the spread of virus (Figure 27).

Figure 26: Orchid weevil borer damage on SSO dendrobiums

Figure 27: Harvesting orchid sprays by hand to prevent spread of virus

[17] *Cymbidium mosaic virus, Odontoglossum ringspot virus and Tobacco mosaic virus*

Gingers

Until fairly recently, gingers grown in Fiji were considered to be largely free from major pest and disease problems. However, over the last five years “red ginger decline” has emerged as a major disease problem in the Suva area. Some characteristics of this disease are:

- flowers and plants grow smaller and die back;
- leaves turn pale green and die early and
- dead roots and rotten rhizomes.

Photograph: Jacqui Wright

Red ginger decline is likely to be caused by a fungal pathogen (*Pythium* spp.), although this has not been confirmed scientifically. This disease can gain access to the ginger rhizome through damage caused by nematodes. It is suspected that red ginger decline was introduced from a ginger plant smuggled in from Hawaii. In 2006, plant pathologist Jacqui Wright working with red ginger decline in Fiji concluded that gingers take up a huge amount of potassium from the soil and become deficient very quickly. It is believed that this deficiency weakens the plant to the attack of pests and diseases. It is recommended that more research be done into the issue of red ginger decline and the possible link to a potassium deficiency (Wright, 2005).

Insect pests cause only minor damage to the ginger inflorescence and rarely does it affect the marketability of the product. Insects, however, can pose a serious quarantine problem in the exporting of gingers. By virtue of their form, these flowers, as with heliconicas. commonly harbour insects.

There is a variety of common insect pests and diseases that affect gingers grown in Fiji, these are listed in Annex 1 and compared with those found affecting gingers in Hawaii.

Heliconias

Heliconias in Fiji are normally free of most serious pests and diseases if they are grown in the conditions that suit them. Insect pests such as aphids, mites, mealy bugs and other scale insects will be found on heliconias. These can cause minor damage to the inflorescences and thus reduce marketability. However, insects can pose a serious quarantine problem for growers wishing to export heliconias. Pest control requirements vary between countries, however, there has been a number of effective quarantine treatments developed to overcome this constraint.

Fungal diseases, *Phytophthora* root rot and *Phythium* stem rot are the main disease problems for heliconias in Fiji. These diseases often occur when there is an extended wet period, coupled with poor drainage. Fungal disease problems can be accentuated when heliconias are too crowded, restricting air circulation. Fiji growers have found that with good horticultural practices, decline in production caused by disease can be kept to a minimum.

Bromeliads

Apart from native bromeliads and a few imported varieties, there is very little in the way of commercial hybrid bromeliads in Fiji. Consequently, there are few pest and disease

problems for production in Fiji. Apart from common insect pests and diseases, there appears to be little potential threat from pests and diseases in a commercial production setting here Fiji.

Various leaves and ferns

There are no major pests and diseases recorded affecting the foliage leaves and ferns produced in Fiji. A grower identified a spotting on Cordyline at a recent describe workshop and she has appealed to MAFF Plant Protection for identification and assistance. Thus far, no conclusive results have been brought forward. If growers switched to very intensive production practices, this would compound the common pest problems. However, this is unlikely to develop, given that these products are field grown in household gardens or surrounding village The absence of the Giant African Snail is also seen as favourable.

Potted plants

With the majority of potted plants being produced in household gardens or semi-intensive shade house conditions, there is very little threat from major pest and disease outbreaks. This segment of the industry is not dependant on only a few commercial hybrids, making the plants less susceptible to major outbreaks. The relatively small scale of the industry in Fiji and limited importation of plants supports the favourable pest and disease status given to potted plants.

Palms

As with potted plants, palms have not seen any major pest and disease outbreak that cannot be controlled by normal production practices. Furthermore, with the majority of palm production done in mixed potted plant systems, the risk of a major pest and disease outbreak is greatly reduced.

Roses

Whilst some rose varieties can be grown in Fijian conditions, the climate is not conducive to growing the quality flower that the global market has come to expect (Morrell 2004). However, Morrell noted that because there is a local market that is currently served with costly imported roses, there is good argument to put in a small pilot greenhouse (2004). The major constraint to commercial rose production in Fiji is the pest and disease problems, mainly fungal, accentuated by the hot humid conditions. Due to the hot and humid weather conditions it is expected that Downey mildew will be the limiting factor to the viability of a commercial rose production operation (Morrell 2004).

Overall conclusion

Fiji continues to have a significant advantage in terms of its pest and disease status compared to many other producing areas. The future of the ornamental horticulture industry depends on the maintenance of this relatively favourable status. Fiji has been fortunate to maintain this status despite the poor assessment of the performance of the industry and the governments quarantine service in this area.

5.2.3 A substantial under-supplied tourist based market

The Hawaii model of tourism based floriculture demand

The Hawaii floriculture industry provides a model of the potential for a Fiji floriculture industry built around supplying the tourism sector. The wholesale value of floriculture and nursery products produced in the State of Hawaii now exceeds USD 1,000 million (Table 24). This compares to around USD 1 million estimated as the value added of the Fiji floriculture industry. Hawaii has a resident population of around 1.3 million[18], compared with some 900,000 for Fiji. However, Hawaii has nearly 8 million visitors arrivals annually[19] compared with 545,000 for Fiji (2006).

Table 24: Floriculture and nursery products: wholesale value, State of Hawaii, 2001-2005 ($US, 000)

Commodity	2001	2002	2003	2004	2005
Cut flowers[1]	14,566	13,055	14,183	13,204	14,067
Orchids	20,650	22,823	23,439	22,769	22,201
Lei flowers[20]	3,928	4,170	3,704	3,397	3,686
Foliage[3]	20,380	17,746	16,966	17,621	19,406
Potted flowering plants	5,010	7,052	5,563	6,004	6,151
All other nursery products[4]	22,838	29,569	30,391	30,848	33,769
Unspecified sales[5]	1,225	1,300	1,355	1,335	1,320
Total	88,597	95,715	95,601	95,178	100,600

[1]Cut orchids included in "Orchids" category.
[2]Orchid blossoms are included in "Lei flowers" category.
[3] Includes potted, cut, and unfinished. Beginning 1998, Landscape foliage included with "All other nursery products".
[4] Includes bedding plants, plant rentals, propagation materials, and any other nursery products not elsewhere classified.
[5]Includes sales of growers greater than $999 but less than $10,000 which were not categorized.
Source: Hawaii Agricultural Statistics Service. February 2007

Hawaii, like Fiji, is an island economy whose main industry is tourism. Hawaii has certain advantages in comparison to Fiji, particularly being an integral part of the US economy, having better transportation links and enjoying a much higher level of agribusiness investment. Political stability has afforded greater surety to tourism growth in Hawaii and thus its links with the floriculture industry are stronger than is the case in Fiji. However, Hawaii has some relative disadvantages in terms of high labour costs and land prices.

Hawaii provides a guide to the demand for flowers that can be generated from a flower orientated tourism industry. Around 4.8 million dendrobium sprays and 17.3 million dendrobium blossoms are sold in the State of Hawaii annually (Statistics of Hawaiian Agriculture 2007). This represents an average of around 10 orchid blossoms per visitor (assuming 90percent of local sales are to the tourist sector). On this basis Fiji, with 545,000 tourist arrivals in 2006, has a potential market of 5.45 million dendrobium orchid

[18] U.S. Census Bureau 2006.
[19] Research and Economic Analysis Division of the Dept. of Business, Economic Development and Tourism March 2007.

blossoms (or 420,000 spray equivalents) annually. This compares with Fiji's current dendrobium orchid sales of around 100,000 sprays. A similar comparison can be made for anthuriums. There is a potential market of 472,000 anthurium stems at the 2006 level of tourist arrivals based on Hawaii's anthurium consumption per tourist arrival. This compares with Fiji's actual anthurium consumption of around 65, 000 stems.

In recent years, there has been a decrease in Hawaii's cut flower consumption and a substantial increase in imports of cut flowers from Thailand and Singapore. The structural change for the local industry has been to move from cut flower to pot plant rentals, especially orchids and anthuriums supplied to the hotels. In 2005, pot plant rental increased by nearly 50percent compared with the previous year. Pot plant rentals to the hotel sector remain a virtually untapped market opportunity for the Fiji floriculture industry.

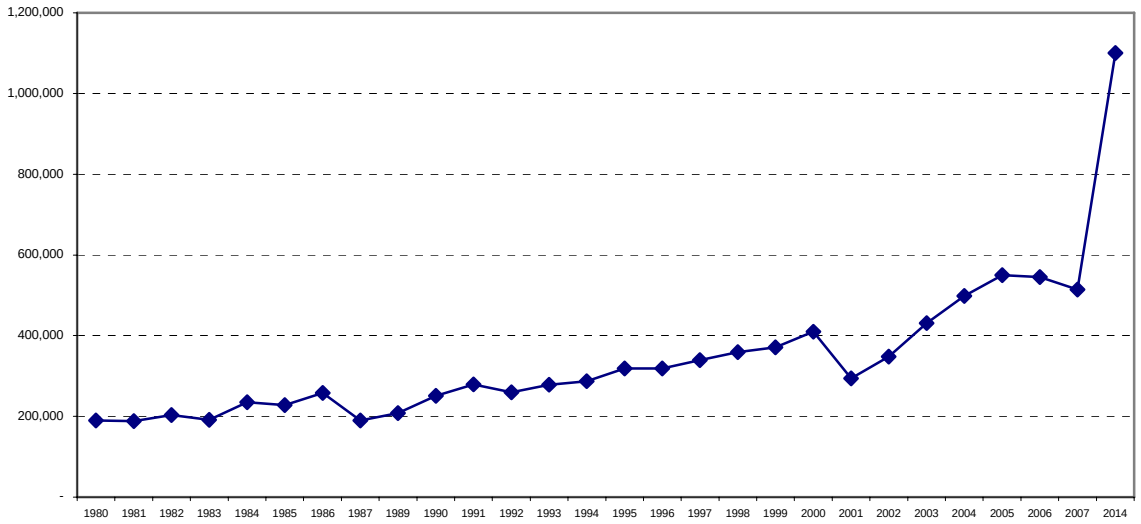
Hawaii has shown the potential of the carry on trade with departing tourists. Substantial volumes of macadamia nuts, papaya, and flowers are sold to departing tourists, particularly from Japan. In 2001, the value of "Hawaii Food Products" (including cut flowers) sold to departing tourists was $102 million (Department of Business and Economic Development and Tourism year). Cut flowers, with the exception of New Zealand, are permitted into all the source countries for Fiji's tourists. Dendrobium orchids and anthuriums are an ideal carry-on purchase. They are lightweight, have a beauty associated with a sophisticated life style and have a long vase life. Japanese visitors to Fiji, in particular, are reported to be often frustrated that they cannot buy suitable local gift products[21].

Projections in Fiji tourist arrivals

Fiji's visitor arrivals increased from 294,070 in 2000 to 545,168 in 2006. For 2007, the Fiji Visitors Bureau (FVB) had projected that tourist arrivals would reach 575,000 (FVB 2006). However, FVB now expects arrivals will only reach around 514,000 (FVB 2007) following the military coup at the end of 2006. Figure 28 provides a look at the tourist arrivals from 1980 to date as well as projections to 2014 (Fiji Tourism Development Plan 2006). The achievements of these projections will, of course, depend on political developments in Fiji and the subsequent reaction of the host markets. However, achieving a 1 million tourist arrival target over the next 5 to 10 years would seem an achievable target. Based on Hawaii per capita consumption levels, this represents a potential market for around 800,000 orchid sprays and 900,000 anthurium stems.

[21] *In 2006 there were 24,369 tourist arrivals from Japan.*

Figure 28: Fiji tourist arrivals and projections 1980 through 2014



Source: Fiji's Tourism Development Plan, 2006.

A look at Hawaii indicates the growth in tourism arrival numbers that can occur. In 1965, Hawaii's tourist arrivals were 680,000. By 1990, the numbers had swelled to almost 7 million, a level at which they stabilised (Hawaii Visitors & Convention Bureau, Annual Research Reports). Apart from the prevailing political environment, growth in tourist numbers in Fiji is currently constrained by the shortage of five star hotel accommodation – the industry segment most likely to purchase cut flowers. Developments such as the Momi Bay and Natadola projects, when they eventually materialise, are likely to increase the demand for cut flowers significantly.

The key for Fiji developing a significant tourism based floriculture industry is for a "culture" to develop in the tourism sector that places priority in the use of high value flowers. Hawaii's tourism image and flowers are intertwined at all levels. In Fiji, there is a general lack of appreciation for the value of flowers in the enhancement of the Fiji tourism product in most hotels and resorts. In part this might be excused by the inadequate supply of flowers. The present lack of a "flower culture" is perhaps no better reflected than in the greeting of tour groups with shell necklaces imported from the Philippines, rather than with flower leis, which is commonly the case in Hawaii. The FFC Strategic Plans makes recommendations for the encouragement of the development of a flower "culture". These are discussed in 4.2.3.2 below.

Mrs. Aileen Burness from South Sea Orchids (Project Coordinator: Partner Country), undertook a study tour of the Hawaii floriculture industry in March 2007. The purpose of the study tour was to review the relevance of the Hawaii floriculture experience to the Fiji industries and where possible deepen the linkages between the Fiji and Hawaii industries.

Survey of Tourist Industry Operators

In order to assess the tourism industry in terms of; current consumption of ornamental horticultural products, and future demand for these products, a survey was undertaken. The survey involved a sample of 35 hotels on Viti Levu and Vanua Levu. Results revealed that only 17 of the surveyed hotels purchased floriculture products on a regular basis.

Seven others indicated that they only purchase on demand or as requested. Eight of the surveyed hotels indicated that they never purchase floriculture products. As such, the Fiji tourism sector clearly has a long way to go before it approaches the situation found in the Hawaii industry.

The majority of the hotels listed their own nursery or landscape as the primary source of their cut flowers, foliage, potted and landscape plants. Although the larger four and five star resorts recorded the highest usage, these hotels relied primarily on products produced internally. Only eight of the seventeen hotels that regularly purchase floriculture products spend more than $50/week on these products.

On the question of in-house florist services, a remarkable 100 percent of the hotels surveyed responded that they had an in-house florist, or staff that provided this service. Housekeeping and restaurant staff are identified as serving the function of in-house florist.

The strict purchasing requirements of hotels was shown in that over half of the surveyed hotels required credit of between 30-90 days and 80 percent of the hotels required delivery to their premises. Of the 17 hotels that regularly purchase floriculture products, nine deal exclusively with one florist and/or wholesaler, a further six hotels purchase from private individuals, either solely or combined with the florist/wholesaler.

Overall conclusion:

Based on the Hawaii experience, the tourism market for floriculture products in Fiji remains significantly under realised and provides the basis for a major industry. The key for Fiji developing a significant tourism based floriculture industry is for a “culture” to develop in the tourism sector that places priority in the use of high value flowers.

5.2.4 A strong non-tourist local market

While tourism offers the greatest potential market for ornamental floriculture products the realisation of this demand has been particularly disappointing to date. Industry growth over the last few years has been largely driven by non-tourist local demand. All of Fiji’s communities place a high value on flowers for special occasions (funerals and weddings) and for general household beautification. With the growth in the urban middle class this demand has grown even further. This demand had been seriously constrained by the absence of a wholesale market, erratic supply, and the high prices that have prevailed. With an established SSO wholesale market many new businesses have been started to service the customers. The local market experiences unpredictable highs and lows related to special life cycle events – deaths, births and marriages. However, with the development of the wholesale market florists have been able to secure contracts with local businesses and churches to supply arrangements on a weekly basis to overcome these fluctuations in business.

Demand for anthuriums and dendrobium orchids far out weighed supply, during the winter months when production decreases significantly. In these periods, the available supplies have to be sharply rationed amongst the many competing buyers. It is estimated that the volume of dendrobium orchids sold on the local market could readily be doubled (some 200,000 sprays annually) at current prices if the supply was available. If there is a substantial upturn in the economy then demand in excess of 250,000 sprays could be reasonably expected.

The non-tourist domestic market still views cut flowers and other floriculture products as luxury items. Although Pacific Islanders have a long affiliation with flowers as part of their culture, the idea of paying for flowers is a new concept. What is generally holding back the potential of the domestic non-tourist market is the lack of a genuine flower “culture” that can be found in places like Hawaii and Singapore.

It has been shown that for the improved variety cut flowers, demand has continuously outweighed the supply. In general, supply is not reaching market requirements because of a lack of high quality planting material. The time and money involved in importing improved variety plants is so restrictive that only the larger growers are able to import. For all other interested growers they must either join the SSO out growers scheme or buy small quantities of plants locally at a highly inflated rate.

Growers and retailers of floriculture products in Fiji generally sell their products at inflated prices. This is also seen as a constraint to the development of the non-tourist domestic market. In order to generate substantial sales in the non-tourist domestic market, a significant decrease in prices is necessary. It has been shown that the demand for floriculture products, especially potted plants is fairly price elastic (buyers are highly responsive to price). Thus, a lowering of price could be expected to lead to an increase in profitability, given the low production costs. A large retail nursery that could consistently provide plants at an affordable price would greatly boost this sector of the industry. If this nursery could source some of its plants from local growers this would encourage the many small-holder nurseries that are currently operating with very little market access.

Overall conclusion

The non-tourist domestic market in Fiji remains undersupplied. A two to three fold increase in ornamental floriculture product consumption is a realistic prospect over the next few years if the supply of good quality products can be made available at reasonable (reduced) prices.

5.2.5 A nascent production and marketing structure already in place

The Fiji floriculture industry is based almost entirely on small and micro enterprises. Even the industry's largest operator, SSO, can be regarded as a small business. The development of a successful small nucleus support enterprise that provides wholesale marketing services has enabled steady growth to be achieved. A three to four fold increase in the size of the industry based on this existing structure is achievable. However such an industry, although making a significant contribution to the wellbeing of the people of Fiji, would remain relatively small. Expansion beyond that level is probably not achievable without the substantial agribusiness investment that has characterised the floriculture expansion in South East Asia, East Africa, Central America and Hawaii. Such investment is particularly necessary if export markets are to be developed, given Fiji's current lack of competitiveness in terms of price, quality and continuity of supply.

The challenge facing the existing Fiji industry and government policy makers is to be able to attract foreign agribusiness investment into the industry without jeopardising the livelihoods of the participants of the existing industry.

In September 2006 Minister of Agriculture announced when opening the 54th Annual Flower Show that China would be providing the following assistance to the Fiji floriculture industry produced a negative reaction from the floriculture industry.

As for the Government's contribution, apart from strengthening the institutional capacity and the token provision in terms of funding, we will continue to seek assistance from our trading partners, who have the required high level expertise in the industry. In this regard, the People's Republic of China, following our Joint Agricultural Commission meeting in Suva in June this year, has readily agreed to assist us in three ways:

- to send an expert on a study tour to Fiji to look into the viability of large, commercial scale flower production
- to provide germplasm for varieties of flowers new to Fiji

- through trade in flowers.

(Speech by the Minister for Agriculture at the Opening of the 54th Annual Flower Show 27th September 2006).

The announcement was not meet with the enthusiasm from existing industry stakeholders that the Minister might have expected as reflected in the following letter to the Fiji Times (Oct 6th 2006)

China and the Fiji floriculture industry

The Minister of Agriculture at his opening of the Suva Orchid and Horticulture Show announced that the People's Republic of China will be sending an expert to Fiji to look into the viability of a large, commercial scale flower production. For the information of the Minister we already have a vibrant commercial flower industry based on several hundred small growers. Can the Ministry please explain why it necessary to invite the People's Republic of China to establish a floriculture operation here, which threatens to put our existing growers out of business. Aileen Burness; Ana Matai; Liz Morris; Verona Lucas

Overall conclusion

A three to four fold increase in the size of the industry based on this existing structure is achievable. Expansion beyond that level is probably not achievable without the substantial agribusiness investment that has characterised the floriculture expansion in South East Asia, East Africa, Central America and Hawaii. The challenge facing the existing Fiji floriculture industry and government policy makers is to be able attract foreign agribusiness investment into the industry without jeopardising the livelihoods of the participants of the existing industry.

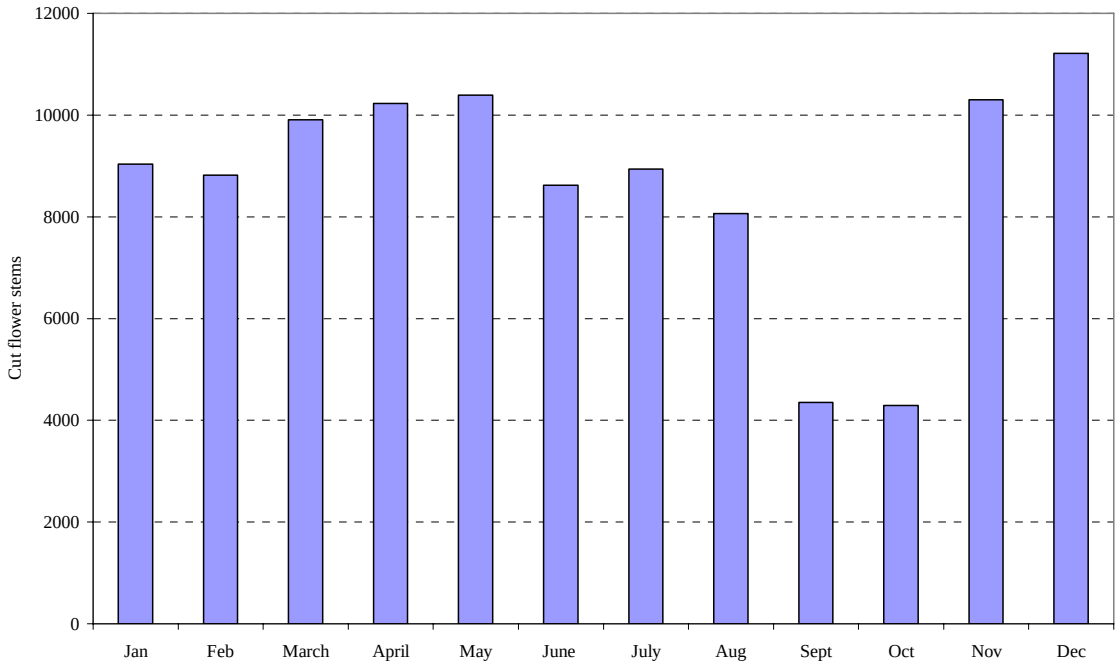
5.2.6 A strategic location with respect to Pacific Rim markets

A key basis for the FFC's goal of Fiji becoming a major exporter of floriculture products was its strategic location with respect to Pacific Rim markets. For example, markets for Fiji orchids and anthuriums in Hawaii from December to February (the cooler, lower production months in Hawaii, and the warmer, higher production months in Fiji) (Figure 29). Other off-season markets were also identified for maile (*Alyxia oliviformis*) in Hawaii, anthuriums in Japan, and orchids in New Zealand. Based on these markets the Strategic Plan established an export performance target:

- the value of floriculture exports to exceed $1.5 million by 2001 and $6 million by 2003.
- floriculture to be amongst the top 10 export industries by 2003 and in the top 5 by 2005.

The actual export performance in 2005 was only $14,277 an insignificant fraction of these targets.

Figure 29: Average dendrobium orchid yields by month 2001-2005



Source: SSO Floriculture Project Report, 2006.

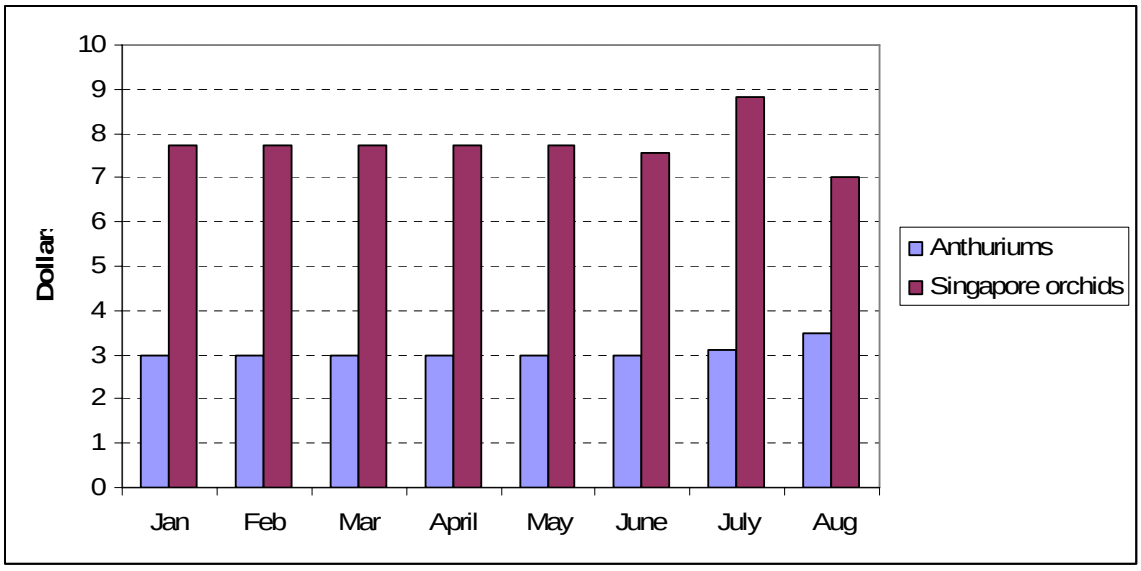
There remains interest from Hawaii to import cut flower orchids from Fiji during the Hawaiian winter (October to March). Watanabe Floral Inc., one of the largest wholesale and retail markets for floriculture products, indicates many of their customers would rather buy University of Hawaii varieties of dendrobium orchids (the variety grown in Fiji) because of their longer shelf life. It is also reported that cut flower orchids imported from South East Asia have nearly half of the buds unopened and these usually do not open. The availability of local cut flower orchids has declined in Hawaii in recent years with a structure change in the industry toward potted orchid rentals. Fiji's ability to take advantage of these opportunities continues to be constrained by the high local prices and limited freight capacity available to Hawaii[22].

Another niche floriculture market export opportunity that remains in Hawaii is that of maile leis (*Alyxia oliviformis*). The Cook Islands is currently a major supplier of maile leis to Hawaii with weekly exports. Mea Pacific Traders has been interested in sourcing maile leis from Fiji since the mid 90's when supply was very low. His interest sparked a feasibility study for the sourcing of maile from village women in the Central Division (McGregor, 1999). A successful shipment was made but continuity of supply could not be maintained. Mea Pacific Traders remain interested in importing maile leis from Fiji if consistent supply can be assured[23].

Off season markets for cut flowers and foliage continue to exist in New Zealand. However, recent data for Sydney market for Singapore orchids and Mauritius anthuriums suggest a lack of seasonality in the Australia market

[22] *There are 3 flights a week from Nadi to Honolulu. However on the small 737 aircraft that fly this rout their are space and weight restricted thus cargo space is dependent on passenger load and weather enroute*
[23] *In March 2007 Mea Pacific Traders owner Dave Thompson provided a formal letter of interest to Fiji for importing maile leis.*

Figure 23: Monthly average prices (AUD$) per stem for Singapore orchids and anthurium at Sydney Flemington Flower market.*



**Source: Sydney Marketing Report Service, 2007*

In principle Fiji could be in a position to take advantage of these seasonal opportunities in New Zealand. However, price, quality and continuity of supply considerations mean that these are not realistic opportunities for the foreseeable future.

The reality is that Fiji is in no position to compete with Singapore and Thailand in the supply of orchids to the Australia and New Zealand markets. Cut flower prices from Japanese and Singapore wholesale markets (2006) are provided in Tables 25 and 26. These prices are well below what Fiji producers would have to charge to earn even a small profit from exporting.

Table 25: Japanese Market Cut flower prices Week 8 2006

Product Name & Source	Average price US$	Main origin
Anthurium Pink	0.60	HAI USA
Anthurium Red	0.58	HAI USA
Anthurium White	0.94	HAI USA
Heliconia Pendula	3.20	SGP
Orchid Anna	0.26	SGP THA
Orchid Oncidium	0.70	SGP TAI THA
Orchid Sonia	0.21	THA
Source: ITC 2006		

Table 26: Singapore Market Cut flower prices Week 8 2006

Product Name & Source	Average price US$	Main origin
Anthurium Assorted Medium	1.11	MAL
Anthurium Assorted Small	0.80	MAL
Anthurium Assorted XL	1.53	MAL
Anthurium Assorted XXL	1.66	MAL
Anthurium Green/Pink/Red A	1.18	MAL
Anthurium Green/Pink/Red AA	1.30	MAL
Anthurium Green/Pink/Red AAA	1.38	MAL
Anthurium Local	0.21	MAL
Heliconia Hanging Pink	1.35	MAL
Heliconia Hanging Red	1.11	MAL
Heliconia Local	0.18	MAL
Heliconia Upright Mini Red	0.37	MAL
Heliconia Upright Pink	1.11	MAL
Heliconia Upright Red	1.11	MAL
Orch. Cymbidium Green NLD Stk 1 22.50 13.81	13.81	NLD
Orch. Cymbidium Yellow NLD Stk 1 21.50	13.20	NLD
Orch. Dendrobium BS THA Stk 20 0.30	0.18	THA
Orch. Dendrobium L THA Stk 20 0.60	0.37	THA
Orch. Dendrobium M THA Stk 20 0.50	0.31	THA
Orch. Dendrobium S THA Stk 20 0.40	0.25	THA
Orch. Dendrobium XL THA Stk 20 0.70	0.43	THA
Orch. Oncidium L MAL Stk 10 0.90	0.55	MAL
Orch. Oncidium M MAL Stk 10 0.60	0.37	MAL
Orch. Oncidium S MAL Stk 10 0.45	0.28	MAL
Orch. Oncidium XL MAL Stk 10 1.10	0.68	MAL
Orch. Phalenopsis CHI Stk 1 4.00	2.46	CHI
Source: ITC 2006		

This situation is confirmed in work undertaken with the Pacific Islands Trade and Investment Commission (PITIC) (Sydney) in 2006 on behalf of exporters Fiji and PNG to help access the Australian cut flower market. Dendrobium orchids and anthuriums were sent to Australia from Fiji as a funded program trial. The outcome of these efforts was not positive. The PITIC report found that the landed price from Fiji and PNG where 50 percent to 200 percent higher than Australian wholesale prices. There were major issues of volume, consistency of supply and quality (species, colours, sizes, post harvest handling and packaging). The report notes that "post-harvest handling, refrigeration and cool chain integrity needs to be established or we can forget it" (PITIC, 2006).

Amongst the small number of importers that are interested in dealing with the Pacific Island suppliers the risks are seen as too high and the volumes to low. As one importer interviewed by PITIC put it "why would I be interested in dropping an established Asian supplier that provides the right product at the right price every week to buy from Fiji?

The specific comments on the dendrobium orchids and anthuriums sent from Fiji were:

Dendrobiums

- Importers / distributors only interested in large white but volumes were much too low for an order.
- Blooms too small compared with Singapore orchids that are the industry standard.
- Colour range unsuitable (weak compared with Singapore orchids).
- Individual packaging required as this is the industry standard.
- Refrigeration post harvest expected to maximize shelf life.

Anthuriums

- Only interested in colours that could not be sourced from existing suppliers. Not sufficient supplies of these to justify a shipment.
- Individual packaging required (spade shield etc).

PITIC (Auckland) undertook a similar study of the New Zealand market in the mid 1990s and reached similar conclusions.

The overall lack of competitiveness of Fiji's floriculture products on international markets is reflected in the price and quality of orchids available at Singapore's Changi International Airport (Figure 30). In mid-June 2007, 50 large sprays of assorted orchids (dendrobium and vanda) were sold to departing passengers for $S55 (equivalent to $F35). Each spray (ISO 9001 certified) is contained in an individual vial and packed in a high quality carton. This compares with the Tadra Flowers price of $6.75 VIP for a single orchid spray at the Nadi International airport.

Figure 30: Orchids for sale at Singapore's Changi International Airport

Orchids are a popular tourist purchase at the Singapore airport. Flowers are well priced and well displayed.

Flowers have more unopened buds than the dendrobiums for sale in Fiji and it is reported that the University of Hawaii varieties of dendrobiums grown in Fiji have a longer vase life (Leonhardt, 2006).

Individual flower bunches have a plastic sleeve and damp cotton wool to prolong the life of the flowers during travels. These flowers have ISO 9001 certification.

Overall conclusion

Fiji's location does not afford any particular advantage on international floriculture markets. Overall Fiji's landed prices for cut flowers are too high and volumes too low to be competitive. There may niche markets for speciality products such a certain types of leaves and off season orchids into Hawaii. However, these markets have yet to be proven by Fiji exporters.

5.2.7 Competitive labour costs

Ornamental horticulture is a labour intensive activity. Thus wages rates and labour productivity will be key determinates of competitiveness.

The base wage rates for floriculture workers in Fiji, Hawaii, Singapore, Malaysia, Indonesia and Mauritius are compared in table 27.[24] Fiji wage rates are considerably lower than those prevailing in Hawaii and less than those of Singapore. They are about comparable to those of Malaysia and Mauritius and higher than those in Indonesia.

Table 27: A comparison of floriculture industry base wage rates (FJD equivalents

	Fiji*	Hawaii**	Singapore***	Malaysia***	Indonesia***	Mauritius****
Unskilled labour	12				6	10
Semi skilled gardener (some horticulture skills)	17.6	130	30-35	14 - 16	10	
Supervisor (experienced with horticulture skills)	25		45 - 55			
Horticulturalist (with diploma)	100		75 - 85			

Source
** SSO*
*** Hawaii Agricultural Statistics Service. February 2007*
**** David Lim Manager Mandai Orchid Garden Singapore Orchids Pty Ltd. www.mandai.com.sg*
*****Republic of Mauritius – Central Statistics Office. www.gov.mu/portal/site/cso*

When it comes to labour productivity Fiji does not fare well when compared with competitors. Fiji's skill levels are seen as low by comparison. Neither of the two agriculture training institutions; Fiji College of Agriculture and University of the South Pacific School of Agriculture, provide courses specifically devoted to floriculture. Similarly Training and Productivity Authority of Fiji (TPAF) currently offers no training in any aspect of ornamental floriculture[25]. Therefore there is no resource for the floriculture industry to draw skilled labour from and all training must be provided on the job.

Overall conclusion:

The overall conclusion is that the Fiji floriculture industry has no particular comparative advantage in terms of labour costs and probably is at a distinct disadvantage when skill levels are factored into labour productivity.

5.2.8 Good air freight linkages

Tourism creates a large domestic market for Fiji's floriculture products. The flights that bring the tourists also provide the outward freight capacity for the potential export markets for high value products such as floriculture products. Because of its tourist industry Fiji is far better served with freight capacity than any other PIC. As tourism expands so will this freight capacity and conversely a contraction in tourism will result in a reduction in freight capacity.

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24 The rates for Singapore, Malaysia and Indonesia were supplied by Mandai Orchid Garden of Singapore Orchids Pty Ltd. The company is a major orchid exporter who sources supplies from both Malaysia and Indonesia.
25 In past years there has been a variety of trainings in Fiji and around the region on floral art and horticulture organized through the International Labour Organization (ILO). During a period in the 1990's similar trainings were being offered in Fiji through USP continuing education for adults, Fiji National Training Center (FNTC), and TPAF. The primary instructor in all of these trainings was the late Jimmy Montu who passed away in June, 2007. Jimmy is credited with developing the floral art sector to be what it is today.

Fiji's freight capacity to Pacific Rim markets from Nadi is shown in Table 28. There are daily flights available to Australia, New Zealand and the United States. These are wide body aircraft that carry containers. There are also flights 3 times a week to Japan and once a week to Canada. The volumetric freight rates that apply are high and generally higher than those incurred by Fiji's competitors in Asia and Hawaii This contributes the overall lack of competitiveness of Fiji's floriculture products on export markets.

It was suggested in Fiji's Agriculture Sector Review, 1996, that Air Pacific (Fiji's primary airline company) review it's freight rates for agricultural products and provide reasonable (not subsidised) freight rates (Asian Development Bank, 1996). The critical role a national airline can play in horticultural export development is shown with Thailand's Thai Air, Holland's KLM and Ethiopia's Ethiopia Airways. In the past all three airlines utilised the ATA regulation allowing for Government Ordered Rates (GOR) to stimulate its horticultural export development. The Fiji government should consider such interventions with regard to Fiji's national airline if floriculture and horticultural exports are to be developed.

Table 28: Air freight for cut flowers from Nadi International Airport (June 2007)

Market	Available flights	Airline	Freight capacity	Freight rate** $FJD	Surcharges applicable $FJD
New Zealand					
Auckland	Daily	Air Pacific, Air New Zealand	available	$3.15/kg	0.25/kg fuel + 0.12/kg security + 20.00 per airway bill
Christchurch	Sunday (direct) Daily via Auckland	Air Pacific, Air New Zealand	available	$5.23/kg	ditto
Australia					
Sydney	Daily	Air Pacific	available	$4.00/kg	ditto
Melbourne	Tues, Wed, Fri, Sun	Air Pacific	available	$4.10/kg	ditto
USA					
Hawaii	Mon, Tues, Fri	Air Pacific	Restricted*	$5.75/kg	ditto
LAX	Daily	Air Pacific, Air New Zealand	available	$7.75/kg	
Canada					
Vancouver	Friday	Air Pacific	available	$6.75/kg	ditto
Japan					
Tokyo	Mon, Thurs, Sat	Air Pacific	available	$7.68/kg	ditto

Source: Air Pacific and Air New Zealand.
** Nadi-Honolulu sectors are space and weight restricted thus cargo space is dependent on passenger load and weather enroute*
*** Cut flowers exports are charged for at the "volumetric" rates and thus higher than what is stated above. Volumetric charge is calculated by multiplying the L X B X H and then dividing the product by 6000 and 366 if in centimetres and inches respectively. The resultant answers become the "volumetric weights" in kgs.*

Overall conclusion

Fiji has good airfreight access to all Pacific Rim markets. This gives Fiji a major advantage when compared with other Pacific island exporters of floriculture and horticulture products. This advantage does not extend to competitors in South East Asia and Hawaii, particularly when freight rates are taken into consideration.

5.2.9 Conclusions regarding Fiji's comparative advantage

Fiji's comparative advantage in ornamental horticulture firmly lays in supplying the domestic market. The industry is making good progress in realising this comparative advantage to the non-tourist domestic market. The industry has been less successful in realising its comparative advantage with respect to the tourism segment. Nevertheless, it's comparative advantage with respect to the tourism market remains in tact. Niche export opportunities have been identified for speciality leaves and for indigenous orchids sold in compliance to CITES.

5.3 A more realistic vision and revised goals

The 2000 Strategic Plan for the Fiji Floriculture Industry had as it Vision "A competitive world-class floriculture industry that contributes substantially to the prosperity of the people of Fiji". It is recommended that a more realistic vision for the industry, achievable in the medium term (5 years) be adopted:

"A competitive ornamental horticulture industry that makes a significant contribution to the livelihoods of a significant number of Fiji's households"

A key step in the realisation of this vision is the re-establishment of a Floriculture Council that is commercially orientated and sustainable. Based on the finding of this Scoping Study identified goals of the Council are to facilitate:

1. A "flower culture" within the tourism sector
2. The consistent export of niche floriculture products
3. Increased earning opportunities
4. Enhanced skill levels and professional standards in the industry
5. Improved flow of information to industry stakeholders
6. Improved the quality of products and services
7. Improved quarantine arrangements for imports and exports
8. Improved stakeholder understanding of CITES
9. Increased technical and other assistance to the industry.

5.4 Recommendations for achieving industry goals

The various recommendations of this Scoping Study are structured to achieving the recommended goals of the Floriculture Council.

5.4.1 Revitalisation of the Fiji Floriculture Council

A key recommendation of the FFC Strategic Plan was that a professional secretariat be appointed to implement policies and work Council programs as well as manage the day-to-day operations of the Council. It is unrealistic, and probably undesirable, for Board members to be directly involved in implementing activities and in day-to-day operations. It was noted that the success of the Council would depend on the appointment of a full time professional Executive Director (ED). It was recommended that it would not be possible for the industry to fund an ED of the calibre required and that external funding would be required. It is recommended that the ED position be fully funded for a two-year period, with the option of a one-year extension. This was the approach followed by the United States Agency for International Development (USAID) in providing support for the establishment of the Fiji Ginger Council. AusAID recently funded a similar position for the Fiji horticulture export industry with the establishment of an industry extension service by Natures Way Cooperative (Fiji). The EU expressed interest in funding this position with

the view of having a Dutch national appointed. A funding proposal was prepared (annex 3). Unfortunately this proposal was "lost" in the political turmoil of 2000 and never submitted by the responsible Ministry at the time; the Ministry of Commerce, Industry, Trade and Public Enterprises (MCIT). This proposal now needs to be reactivated and a suitable donor sought. It is unlikely that any Fiji government funds will be available given the current fiscal position of the government.

It was intended that the FFC was to represent all stakeholders in the industry – commercial flower growers, nurseries, wholesalers, florists, and exporters. In 2002, a Council Board was elected that was dominated by floriculture hobbyists and was ineffective in achieving its commercial objectives and in time became inactive. The Council now needs to be reactivated with a Board elected under bi-laws that ensures representation of all segments of the industry with adequate representation of commercial drivers of the industry.

5.4.2 Creating a "flower culture" within the tourism sector

The Strategic Plan recommended that activities be directed at creating awareness of what the flower industry has to offer in terms of enhancing the quality of Fiji's tourism product. Some suggested activities included (with the entities involved in parenthesis):

- Promoting and organising floriculture industry capability awareness events in conjunction with tourism organisations (e.g. displays and presentations at the annual Fiji Tourism Convention). (FFC, Fiji Hotel Association (FHA); Fiji Visitors Bureau (FVB))
- Coordinating Fiji flowers promotion in Air Pacific in-flight material (videos and magazines).(FFC, Air Pacific, FVB)
- Advertising flowers on the FVB web-site and speciality tourism web-sites such as those promoting Fiji as a destination for weddings.

None of these recommendations have been acted upon and they remain equally valid today. These measures are probably now of greater priority given that the development of the ornamental horticulture industry in Fiji is heavily dependent on expanding linkages with tourism.

5.4.3 Fiji becoming a consistent niche exporter of floriculture products

It was never envisaged that the FFC would have any direct involvement in the export of floriculture products. The Strategic Plans outlines a facilitating role for the Council with respect to developing exports. Some of the activities proposed included:

- Negotiating competitive air freight rates on behalf of the industry (FFC, AP).
- Providing up-to-date information on the quarantine requirements of importing countries. (FFC, FQIS).
- Establishing a data base and web-site of the Fiji industry's exporting capability (FFC, ITC providers)

Such activities are just as appropriate for niche export development as they are for the larger scale exports that were originally envisaged by the Strategic Plan. Providing up-to-date information on the quarantine requirements of importing countries is seen as a particularly important requirement.

Additional recommendations that stem from the niche market export opportunities identified by this scoping study are:

- Providing up-to-date information to the industry on CITES and how it impacts the export of orchid plants (FFC, Environment Dept, USP Herbarium).
- The development of an appropriate policy for non timber forest products that would facilitate the legal commercial development of Fiji's indigenous orchids (FFC, potentially ACIAR, SPC, Environ. Dept., MAFF).
- The FFC needs to make ongoing representation to FQIS on market access issues. An immediate priority is to obtain market access for cut flower dendrobium orchids to allow the industry to take advantage of the identified tourist carry-on market (FQIS, FFC, and NZ MAF).

5.4.4 Increasing income earning opportunities from floriculture

The FFC's role in improving income opportunities was seen by the Strategic Plan as providing realistic information on income earning opportunities from various aspects of floriculture and the requirements for success. Good progress in this area has been made with the publication by South Sea Orchids of the manual "Floriculture in Fiji as a Small and Micro Business".

Applied research could also make a significant contribution to achieving this goal. This Scoping Study identified "red ginger decline" as a problem warranting priority research attention. ACIAR is seen as well placed to contribute to resolving a problem that adversely impacts numerous small growers in the Suva, Nausori, and Navua areas.

5.4.5 Enhancing skill levels and professional standards

The SSO out-grower project has shown that smallholders can successfully grow demanding cut flowers if the right training, supervision and direction are provided. However, current skill levels, across the industry, are inadequate. To provide the required training and supervision for an expanded industry, additional professionals are required. As a first step, ornamental horticulture needs to be included as a part of the Fiji College of Agriculture (FCA) curriculum. Landscaping and nursery trades, together with a floral art certificate course need to be included in the TPAF curriculum. The industry also needs at least two or three people to be trained in floriculture from an appropriate overseas institution, such as the University of Hawaii College of Tropical Agriculture.

The Floriculture Industry Strategic Plan identifies a number of specific activities in which the FFC would be involved in to enhance the skills and professional standards of the industry. These recommendations, that still need to be actioned, include:

- working with the USP, FCA and TPAF in the design of the floriculture/ornamental horticulture curriculum, and initially assisting with the implementation of the teaching program
- facilitating donor and technical support for the development of training materials for the industry
- the coordination of workshops and short term industry training programs for the industry (the Council would also be involved in finding funding for such short term training programs)
- identifying appropriate overseas training (and supporting funding) for the industry.

5.4.6 Increasing the flow of information to the industry

A basic requirement is the establishment of a database of all participants in the industry. This Scoping Study has provided the foundation of such a data base. The maintenance of

this database should be an ongoing activity for the Council. With a database established, a regular industry newsletter could be prepared and distributed by the Council. The newsletter would contain regular features on issues such as production, marketing, quarantine and CITES. This newsletter could well become the banner of the Council and become an important source of revenue.

Radio is widely distributed throughout Fiji and for many people it remains the most important source of information. Thus it offers a powerful extension tool for the Council. It would be an appropriate activity for the Council to develop a regular “Fiji Flowers” radio feature.

It was recommended that the Council establish a “Fiji Flowers” web-site to disseminate information about the Fiji floriculture industry to buyers and other interested parties. Over time it was anticipated that the web site would be increasingly used to disseminate information to members of the Fiji industry.

5.4.7 Improving the quality of ornamental horticulture products

International markets are likely to be only interested in the products of small producers like Fiji when they have something special on offer – be it a seasonal window, premium quality or a unique product. This will certainly be the case for Fiji’s floriculture products. The floriculture industry must be at the top end of the quality scale if it is going to compete – there is no place for grade 2 flowers on international markets. The high cost of packing, shipping, and handling are the same regardless of the quality of the product shipped. Furthermore, the premiums paid for quality are usually large. Thus, the net gains to flower growers attributed to quality can be huge and likely represent the difference between profitability and non-viability.

Quality is just as important for flowers sold on domestic markets as it is for exports – particularly if the focus is on tourism based markets. Furthermore, the domestic market provides the foundation upon which possible export markets are developed. If good quality flowers are produced for the domestic market, then it will be relatively easy to extend sales to meet export standards. However, it will be extremely difficult to turn on good quality flowers just for export markets. The major difference is that exports have to meet the quarantine standards of importing countries.

Facilitating improvement in quality should be one of the most important goals of the Council. It will also likely be one of the most challenging. The Council could be empowered by law to enforce industry quality standards. However, this would first require the enactment of legislation. This would be a drawn out process extending over several years and is not realistic in Fiji’s present political circumstances. Furthermore, even with legislative backing, it is unlikely that these quality standards could be enforced. The Fiji Ginger Council, as an example of a council with legislative backing, has made no use of its powers to enforce quality standards on the ginger industry. This is despite the fact that it had long been recognised that one exporter of poor quality ginger adversely impacts the prices of all Fiji exporters. The essential problem is that it is difficult to dictate market determined quality standards to large numbers of relatively small businesses. In the final analysis, the determination of quality and grading standards is a matter between the sellers and buyers at the various stages in the marketing chain. Positive encouragement to improve quality is a more realistic, and probably more effective, approach than the negative enforcement of quality standards. A positive encouragement approach would focus on two main areas:

- Obtaining, presenting and disseminating information on the quality requirements of various markets.

- Providing quality certification that will enhance marketability of those who achieve the standard.

Activities in the first area would include the preparation of quality standard manuals, posters etc., of the type developed by SSO in collaboration with CTA. These materials would be used for training and for the every day use of growers, wholesalers, florists, and exporters. A standards manual would also be an essential ingredient in any quality certification program undertaken by the Council.

Quality certification is more demanding and would take time and significant resources to implement. It is envisaged that the FFC would establish a “Fiji Flowers” quality assurance and certification scheme. Businesses selling Fiji flowers, that are able to meet the code of practices and quality standards established by the Council, would receive the “Fiji Flowers” seal of approval. This certification and its accompanying logo could then be used in the marketing efforts of the business. There would be no compulsion to meet the quality standards required to obtain the Council’s seal of approval. The positive incentive to obtain the certification is the marketing advantage and increased revenue it offers the business. The certification scheme is seen as an important source of revenue to fund the activities of the Council. The development of a certification program will require technical assistance in which ACIAR/SPC could have an important role to play.

5.4.8 Improving quarantine arrangements for imports and exports

Quarantine issues have been identified as a major constraint to the development of ornamental horticulture in Fiji. Quarantine significantly impinges on production and export marketing.

A relatively favourable pest and disease status has been listed as one of Fiji’s competitive advantages. However, this could change rapidly with the introduction and spread of a major pest and or disease. The rapid spread of anthurium bacterial blight (*Xanthomonas campestris*) in Hawaii a decade ago was presented as an example. The continued unexplained proliferation of new flowers and ornamentals in Fiji suggests that the smuggling of plants remains an ongoing problem. This is despite severe penalties (including jail terms) now being in place.

Quarantine procedures for issuing import permits were seen as unnecessarily rigid, inconsistent and often unreasonable. This in part explains why there is apparently a high incidence of plant smuggling, which puts ornamental horticulture and other agriculture industries at considerable risk. An effective FFC, as the representative of the industry, could play a key role in alerting the industry to the dangers of smuggling and to exert moral suasion to desist from this activity.

Major inconsistencies were also identified in quarantine requirements and procedures for the commercial importation of floriculture planting material. As the recognised representative of the industry, the FFC would be expected to play a key role in resolving these inconsistencies that hold back the development of the industry.

Fiji Quarantine has been agonisingly slow in negotiating quarantine “pathways” for fresh produce exports and having them approved by importing countries. The FFC, as the representative of the industry, could play a key role in facilitating the process. This might include finding external funding for pest and disease surveys.

A comprehensive review of Fiji’s quarantine regulations and procedures as they relate to floriculture is required. Such a review is particularly timely, as FQIS moves toward corporatisation. Technical assistance will be needed for such a review and here SPC and ACIAR may have a role to play. An effective Council is required to articulate the concerns

and requirements of the industry during the process of the review, and to promote and assist with the implementation of the findings.

5.4.9 Improving stakeholder understanding of CITES

CITES is vitally important to preserving the biodiversity of Fiji's ecosystems. The good intentions of CITES however can be lost when stakeholders are ill-informed regarding its provisions and what they are intended to achieve. An example discussed in this study is the annual and transaction fees for hybrid orchids sourced from the University of Hawaii exported to other PIC's. In Fiji, there seems to be a very poor understanding of CITES at all levels. Growers and exporters often only see it is an unreasonable hindrance and expense to doing business with no obvious benefits in terms of the preservation of endangered species. The CITES authorities on the other hand, often do not have the technical expertise to properly assess proposed transactions and determine whether or not they should be subject to the CITES convention. Furthermore, neither parties realise the potential for using the CITES convention to their benefit; to protect the biodiversity of the islands while using the resources for income generation purposes.

The FFC is seen as a likely organisation to represent the interests of its members in CITES related issues and to provide information to the industry on the requirements of CITES and on the potential opportunities it creates. A member of the FFC with proven expertise should also serve in this capacity to advise the CITES authorities in Fiji on cases specific to the ornamental horticulture industry.

An FFC sponsored CITES seminar would be an appropriate starting point for improving understanding of CITES as it relates to the ornamental horticulture industry. Such a seminar presented by an international CITES representative, the CITES authorities in Fiji, an ecologist, and other related stakeholders would be very valuable in improving stakeholder understanding of CITES. The USP is seen as a likely potential partner in coordinating such a seminar, considering its involvement with the Regional Herbarium.

5.4.10 Advising and coordinating new starters in the industry

The growing small-holder based floriculture industry has attracted a lot of interest, which has been fuelled by a considerable amount of media attention. Not a month passes without a feature on a flower grower or seller appearing in a news paper or magazine. Floriculture has been rightly perceived as an excellent way for households to generate income and employment. However, it is a demanding industry, where success requires considerable effort, skill and linkages to the market. Ill informed new entrants without these essential ingredients face a high risk of failure. SSO's recently published floriculture business manual is a response to this problem and provides an excellent resource for existing and would be industry participants. However, much more is required in providing realistic information about industry opportunities and the requirements for success. The Council also has a "marriage broker" role to play in bringing together potential growers and marketers. The Council could also provide an on going service in providing small business training in floriculture and in the preparation of business plans for floriculture enterprises. It is anticipated that this work would be undertaken in collaboration with the National Centre for Small and Medium Enterprise Development (NCSMED). It is envisaged that at a modest fee would be charged for the preparation of these business plans.

5.5 Recommendations for ACIAR/SPC involvement with the Fiji ornamental floriculture industry

This Scoping Study identified a number of potential activities for ACIAR/SPC in the development of the Fiji ornamental horticulture industry. These are summarised below.

5.5.1 Red ginger decline research

Identified collaborating partners: FFC, Research Div. MAFF, SPC, ACIAR, DPI NT (Aust.)

As outlined in section 4.2.3, the main constraint currently facing ornamental ginger production in Fiji is "Red ginger decline." This disease has caused a severe reduction in yield in ornamental ginger growing areas. Without scientific proof of the causal agent, growers have only been advised to shift their production to a "clean" area. However, in 2006, SPC's plant pathologist Dr. Jacqui Wright proposed that due to the heavy feeding nature of gingers, that there was a possible link between potassium deficiency and the growing problem of "red ginger decline" and "cutting disease" in Fijian ornamental ginger. The link between potassium deficiency and plant diseases has been known to horticulturists for decades and research has been done on major crops to quantify this link and recommend the required potassium to offset this deficiency and decrease the susceptibility to pest and diseases[26].

The Northern Territory (Aust.) Department of Primary Industries, Australia, recently undertook a project on the nutrition of ornamental ginger (Irrigation and Nutrition Management in Alpinia as a Possible Control of Alpinia Leaf Scorch). The project undertaken in 2003/2004 was successful in determining that nutrient levels were not in balance and that the amount of water being applied was too high[27]. Recommendations were put to growers to apply micronutrients by foliar spray to keep all nutrients in balance[28]. It is proposed that similar research work can be done with ornamental ginger in Fiji to combat the growing problem of red ginger decline. Through ACIAR, the collaborating partners could include NT DPI and Jan Hintze (Lambells Lagoon Farm), the Darwin ginger and heliconia grower who hosted the NT DPI project.

5.5.2 The use of SPC facilities to facilitate the commercial development of indigenous ornamental plants

Identified collaborating partners: FFC, Min Environment, SPC, ACIAR, USP (Regional Herbarium).

There are virtually unlimited opportunities for breeding Pacific orchids and other ornamental plants in commercial hybrid varieties. Pacific island indigenous orchids have already been used in breeding programs to create numerous commercial hybrid species. The Fiji indigenous orchid *Dendrobium tokai* was crossed with *D. phalaenopsis* (Cook Town Orchid) from Queensland Australia to develop the first University of Hawaii hybrid. However, to ensure that Pacific islanders benefit from these new varieties it is proposed to undertake CITES compliant breeding programs here in the Pacific.

It is recommended that such a program be initiated under the auspices of SPC, with the necessary financial and technical support provided. It is proposed to bring together a breeding program which utilises genetic materials from several Pacific island countries into one central location for the purpose of developing 'Pacific Plants' that can then be

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[26] The International Plant Nutrition Institute (IPNI) reports a corn crop producing a grain yield of 12.6 metric tons/ha (200 bu/A) removes about 23 kg (50 lb) of K in the grain (IPNI, 2007).

[27] In the case of Alpinia leaf scorch the symptoms first appear as small (<1cm 2) lesions in the leaves of mature plants. The small lesions develop into large lesions running the length of the leaf. The lesions transfer to the inflorescence when it emerges, which then scars and desiccates. Thus, this condition reduces the yield of Alpinia orchards. During investigations of this condition, it was suggested by agronomists and growers that it could be related to either a nutrient imbalance or to stress induced by over-watering. The nutrition status of plants was studied over a two-year period when samples were taken from leaves at the top and bottom of the stems as well as from leaves showing early scorch symptoms. The soil water status was investigated for 12 months using tensiometers placed at 20 and 40 cm in wet and in dry areas as well as by measuring the level of input on the wet site (Wicks and Connelly, 2004).

[28] It was also recommended that mature Alpinia clumps be given between 80 and 120 L water/day.

distributed back to the floriculture industries of the Pacific islands for mass propagation and resale. The structure of such a project is complex as it involves multiple government departments; quarantine, forestry, plant protection, as well as international treaties such as CITES and plant variety rights (PVR).

A feasibility study to determine the viability of such a project would be a first step in identifying the appropriate partners in this regional endeavour. The feasibility study will require specialist expertise in plant breeding, the commercial aspects of orchid hybridisation and marketing, and international trade policy and regulations relating to the movement of plant materials.

5.5.3 Policy development for non timber forest products

Identified collaborating partners: FFC, Min Environment, SPC, ACIAR, USP (Regional Herbarium).

Fiji, in common with other PICs, does not have an appropriate policy framework in place to deal with minor (non-timber) forest products. An appropriate policy is necessary to encourage investment in the sustainable commercial development of products such as indigenous orchids. It is recommended that ACIAR, as part of a regional initiative, undertake a project to develop polices to facilitate the sustainable commercial development of non-timber forest products such as indigenous orchids. The development of an appropriate policy framework would be a necessary requirement for success of the type of project described in 6.2 above. Fiji Ministry of Forestry is currently in the process of developing a new forestry policy. Thus, such an initiative for minor forest products is seen as particularly timely.

5.5.4 The development of a Gardeners Guide to Fiji's Native Plants.

Identified collaborating partners: ACIAR, SPC, USP (Regional Herbarium).

The purpose of such a manual would be to bring about awareness of Fiji's native plants and the role they can play in domestic gardens and in commercial landscape use. There is need for a reference guide on readily available native plants for gardeners in Fiji. This publication should provide a photographic guide as well as basic information relative to cultural requirements and physical characteristics. Of particular interest will be native coastal species across the Fiji Island group given the location of the majority of Fiji's resort developments. This publication will compile work done by a variety of authors, including botanists and landscape contractors, working with Fiji's native plants. It is expected that such a publication will be a reference for students, professionals in the plant world, and gardeners/landscapers in other Pacific islands.

5.5.5 The development of pilot "Fiji Flowers" quality assurance and certification scheme

Identified collaborating partners: FFC, Min Environment, SPC, ACIAR, USP (Regional Herbarium)

One of the identified goals for the FFC is to improve the quality of floriculture products sold on domestic and export markets. It was suggested that the FFC establish a "Fiji Flowers" quality assurance and certification scheme. Businesses selling Fiji flowers, that are able to meet the code of practices and quality standards established by the Council, would receive the "Fiji Flowers" seal of approval. This certification and its accompanying logo could then be used in the marketing efforts of the business. There would be no compulsion to meet the quality standards required to obtain the Council's seal of approval. The positive incentive to obtain the certification is the marketing advantage and increased revenue it offers the business. The certification scheme is seen as an important source of

revenue to fund the activities of the Council. Certification may only be available to financial members of the FFC. Alternatively, a fee could be charged for the quality certification, or more likely a combination of both.

A market research based pilot project is seen as the appropriate first step to successfully establish a "Fiji Flowers" quality assurance program. ACIAR's new agribusiness research program might be a possible source of support for such a pilot project.

5.5.6 A review of Fiji's quarantine regulations and procedures relating to floriculture

Identified collaborating partners: FFC, FQIS, SPC, ACIAR, AQIS

A number of constraints related to quarantine have been identified in this project. Of paramount importance is the lack of communication on the part of growers, exporters, importers, and FQIS as it relates to floriculture. In trying to address these constraints it is proposed that FFC do a further review of the issues, rank them in terms of importance and then engage FQIS in dialogue to resolve these issues on behalf of the industry. Resources in terms of dollars and human capital, are a serious limitation to FQIS meeting industry needs, therefore there is scope for SPC to assist FQIS and FFC as the need arises

5.5.7 The development of cost effective quarantine treatments for ornamental exports

Identified collaborating partners: FFC, FQIS, MAFF Research, SPC, ACIAR, University of Hawaii, AQIS and NZ MAF.

Several Fiji growers/exporters have identified export markets for various gingers, heliconias, and foliage products. While these markets do not appear to be large, they do provide a further opportunity for income generation to Fiji growers/exporters. For most markets, the requirement is that there are no live insects and that material shipped cannot be propagated. In the past, several of these grower/exporters have been able to meet the quarantine requirements of these markets by adopting a variety of quarantine treatments. However, there is generally little understanding of what quarantine treatments are available and permissible and their cost and efficacy. As such, there is need for an applied research project that makes this information widely available to the industry in a form that is readily useable. Such a project will involve:

- A comprehensive review of the literature – work done by the University of Hawaii is seen to be particularly relevant.
- A comprehensive review of the quarantine requirements of target markets for identified products.
- A testing of the efficacy and financial viability of existing identified treatments under Fiji conditions.
- The development of new appropriate treatments, that suit Fiji conditions and products, where necessary. Priority would be given to treatments that would be suitable for a range of products, including non-floriculture products such as taro.
- Work with FQIS to facilitate improved market access for ornamental horticulture products.

5.5.8 Technical support for national and regional tertiary institutions in the development of ornamental horticulture skills.

Identified collaborating partners: USP (Alafua), FCA, TPAF and SPC.

A major constraint raised by nearly every grower/landscaper interviewed in this scoping study has been the lack of available skilled labour, and lack of technical assistance from MAFF extension officers.

In a closer look at the tertiary educational institutes that should be equipping and supplying these skilled graduates, we learn that there is little or no attention paid to ornamental horticulture. To provide the required training and supervision for an expanded industry, additional professionals are required. As a first step, floriculture needs to be included as a part of FCA curriculum. Technical assistance in curriculum development will be necessary. The University of Hawaii would be an appropriate source for this technical assistance. It is proposed that FCA receive support in the form of a qualified lecturer to teach at least one class on ornamental horticulture. The FCA will be responsible for funding and establishing demonstration resources in line with the program of the new course. It is hoped that this diversification at FCA will spark a wider range of interest in agriculture, by students not wanting the traditional job types that are currently available to graduates. There is a need for at least two or three people to be trained in floriculture from an appropriate overseas institution, such as the University of Hawaii College of Tropical Agriculture and Human Resources. It is also recommended that ornamental horticulture be included as part of an ACIAR scholarship program.

A proposal has been prepared for USP to begin implementing ornamental horticulture into its curriculum at the College of Agriculture in Alafua, Samoa. The project proposal for diversification into a high value crop, the Samoa Anthurium Research Project (SARP), has gained significant interest the floriculture industry in Samoa. Given that the project has not progressed due to financial constraints, it is suggested that this proposal be reviewed for current costing and formatted for submission to a donor agency. While the proposed SARP contains a research aspect, it can also serve as a model for a small business. By year three, the bulk of the research should be complete and there should be sufficient income to absorb the cost of a manager. Any remaining profits could be re-invested in expanding the shadehouse area to include other crops.

The FFC has a key role to play in the coordination of industry training and professional development. Particular activities that have been identified in the Strategic Plan included:

- working with the FCA in the design the floriculture curriculum, and initially assisting with the implementation of the teaching program
- the coordination of workshops and short term industry training program for the industry (the Council would also be involved in finding funding for such short term training programs)
- identifying appropriate overseas training (and supporting funding) for the industry.

6 The Papua New Guinea case study

6.1 Introduction

The White Paper on Agriculture (2005-2014) and the National Agriculture Development Plan (2007-2016) have identified floriculture as having considerable potential to develop into a major export industry and have provisionally allocated significant resources to the achievement of this potential. Yet PNG's current ornamental horticulture is a minor industry which is considerably smaller than that described for Fiji in chapter 4.

The potential for a developing a major ornamental horticulture industry in PNG is based on two distinct export opportunities:

- The export of temperate cut flowers and foliage: The agro-ecological conditions found in parts of the PNG Highlands provide the opportunity to produce high value temperate floriculture products similar to those exported by the successful East African industries.
- The export of products derived from PNG's unique indigenous orchids. PNG's wide range of diverse habitats has resulted in members of the *Orchidaceae* family becoming specialised so that the country has become richly endowed with endemic orchids, many of which are horticulturally attractive. There are opportunities to commercially develop these indigenous floriculture products in an environmentally sustainable manner.

This scoping study explores the feasibility, opportunities and requirements to develop these two distinctly different types of floriculture industries. Consideration is also given to the opportunities and requirements to develop a floriculture industry in PNG based on the local market along the lines of that described in the Fiji study.

6.2 An overview of the PNG ornamental horticulture industry

This overview deals with the two distinct segments of the PNG ornamental horticulture industry: the cut flower and foliage segment and the indigenous orchid segment.

6.2.1 The cut flower and foliage segment

For decades, villagers have sold rings of alpine flowers to motorists near Daulo Pass in the Eastern Highlands. These are worn or placed on vehicles to indicate that someone has been on a journey via Daulo Pass. Everlasting daisies are used as hair decoration in parts of the Southern Highlands and may be sold occasionally. Cut flowers are now sometimes sold in highland and lowland markets. However, unlike the situation in Suva or Honiara, flowers are not common items in fresh food markets. Such markets could be readily developed in PNG.

The cut flower growers

This profile of the PNG cut flower grower segment was largely compiled from information obtained during the field visit to PNG which was undertaken as part of this scoping study. The coverage is of cut flower growers in the Goroka District (Eastern Highlands); Mount Hagen District (Western Highland); Lae District (Morobe Province) and Port Moresby (National Capital District).

The Goroka District (Eastern Highlands)[29].

There are four cut flower grower groups reported to be operating out of the Eastern Highlands. These are:

- The Kerefa Women's Association
- The Notofana Group
- Gilaheka Group
- Komiufa Growers Group

Figure 1: Eastern Highlands cut flower groups

The Kerefa Association: has 70 members (including around 15 men) that grow a range of cut flowers and leaves. This group was founded in 2003 by Margaret Harvey, a Goroka based business woman. The group was organised to supply Port Moresby based florist Exotic Blooms. The Kerefa Association was the first group of flower growers with which Exotic Blooms worked. Members also supply flower arrangements to the Bird of Paradise Hotel and other Goroka business houses. A wide range of temperate flowers and leaves are grown, including various lilies, tuber roses, roses, carnations and cordyline leaves. A resource and training center was built by the Association and is currently utilised as the groups meeting venue.

Exotic Blooms has provided training to the Kerefa Association with funding provided by the ADB Smallholder Support Services Pilot Project (SSSPP).
Exotic Blooms principal, Sally Napolioni, describes the development of this relationship as a "trial and error" process in terms of training and marketing. Initially, the Kerefa Association made weekly shipments to Exotic Blooms. These are now much more intermittent.

The Notofana and Gipaheka Groups: The Notofana and Gipaheka Groups have 45 members and 80 members respectively. Notofana concentrate on growing tuberoses, while the Gipaheka group mainly produce cordyline leaves. Combined, the two groups cultivate over 45,000 plants and have established their own resource and training centers. Both groups supply Exotic Blooms (twice weekly) and Goroka business houses. Gipaheka are the source of the leaves for Exotic Blooms trial shipment to Melbourne.

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[29] Unfortunately the stakeholder meeting in Goroka did not proceed as planned due the flight cancellation by Air Nuigini. Information on the flower growing groups that were to attend this meeting was obtained from other sources including: Asian Development Bank 2005; Reports of the ADB Small Holder Support Services Pilot Project (SSSPP) who have been providing support for these groups; and interviews with John Hunt (Project leader SSSPP) and Sally Napolioni (Port Moresby based Exotic Blooms who buys cut flowers from these groups.

Komiufa Growers Group: This group is part of a proposed Komiufa integrated rural development area being promoted by environmental scientist Romius Waki (Gelm Ltd. There are ongoing discussions with a Singaporean investor who is interested in a joint venture for rose development.

Mount Hagen District (Western Highlands)

Some 50 women cut flower growers attended the Mt. Hagen stakeholder meeting held on July 25th, 2007. One participant grew indigenous orchids as a small business. The participants came from villages in and around Mt Hagen. They do not have a formal association, although they plan to form one. The women grow a range of temperate flowers, cordyline leaves, indigenous orchids and some tropicals such as heliconias. A few growers sell flower arrangements to the Highlander Hotel and to Mt. Hagen business houses. There have been no shipments made to Port Moresby or other outside locations. No flower sales were observed in the Mt Hagen market.

Figure 2: Participants at Mt Hagen stakeholder meeting

The participants in the stakeholder meeting described their floriculture activities and gave their reasons for growing flowers in order of importance as:

- household beautification
- decorating church
- plant collection
- income generation in local area (sales for weddings, funerals and graduation).

The floriculture aspirations of the Mt. Hagen participants were listed as:

- to plant flowers as a business
- to secure landscaping and beautification contracts with the Mt Hagen City Council
- to sell flowers to business houses, hotels, weddings, funerals and local markets
- to sell flowers to other provinces and overseas
- to develop partnership with floriculture industries in the Asia Pacific region.

The Mt Hagen participants ranked their major constraints and problems developing floriculture as an income earning opportunity as:

- pest and disease
- availability of planting material for new varieties
- theft

- transportation to market
- lack of packing material
- lack of finance
- lack of cooperation amongst growers
- lack of information of flower growing and flower arranging
- no florists in Mt Hagen.

The Mt Hagen participants requested assistance in the following areas:

- training in flower growing and flower arranging
- assistance in finding markets
- exchange visits with other flower growing groups in region
- information on new varieties and sources of seed.

Lae District (Morobe Province)

A total of 39 flower growers attended the Morobe stakeholder meeting at the National Agricultural Research Institute (NARI) Conference Center in Lae. The majority (31) came from the Morobe Province. Others came from as far a field as Maprik in the East Sepik, the Western Highlands and from Enga Province. The Morobe growers fell into 4 groups:

1. The wives of NARI research staff at Bubia who plant flowers around their houses in the NARI compound.
2. The Erap Group from the Markham Valley
3. The Butibam Village group
4. The Lae town group

Figure 3: Participants at Lae stakeholder meeting

Site visits were made to the nearby growers of indigenous orchids and heliconias. The most common orchid was Morobe Shower (*Dendrobium lineale* Rolfe), which has outstanding cut flower characteristics (extended seasonality, spray yield, outstanding appearance and long vase life). These orchids are only used in flower arrangements sold in and around Lae. There is a small (5 acres) commercial ginger and heliconia farm outside Lae. This business, owned by a mining company, air freights weekly consignments to the PNG Gardener florist in Port Moresby. There are no florists operating in Lae and no flowers were observed in the Lae market. Both areas offer opportunities for small and micro enterprise development.

Figure 4: Site visits to Lae growers

The Lae participants described their floriculture activities and gave their reasons for growing flowers in order of importance as:

- flowers to beautify home and surrounds
- grow orchids because of their low input requirements
- to participate in the flower display and competition at the Morobe Agricultural Show
- flowers on the farm to protect crops from pest and disease and to attract bees for pollination of fruits
- decorating church
- plant collection
- income generation in local area (sales for weddings, funerals and graduation).

The floriculture aspirations of the Lae participants were:

- to plant flowers as a business
- go home and encourage our women to grow flowers
- increase the number of flower shows to create markets
- create and operate a small market for all women to sell their flowers so we could then sell to big markets
- form an association and establish a wholesale/main supplier e.g. (mountain flowers) - so the main supplier buys from individual growers and supplies to their clients
- develop local and hotel markets.

The major constraints and problems identified by the Lae participants, in order of importance, were:

- lack of knowledge and skills in the field of floriculture i.e. how to grow, arrange, and maintain our flowers
- lack of awareness on the potential or opportunities available for these products
- no market – lack of information on marketing
- no organised network to meet demand
- pest and disease issues.

Assistance requested from the stakeholder participants:

- organised workshops and training sessions
- training in quality control and pest management
- attend floriculture conference where we can meet up with other women involved in floriculture around the Pacific
- use existing women networks to provide information on available markets
- conduct survey and observe different varieties of flowers like orchids etc. and tell us which flowers are best for sale overseas etc
- assist market research – both locally and international
- provide access to new and improved varieties
- the establishment of a central nursery to distribute planting materials to contract growers
- the establishment of a wholesale distribution centre
- the provision of a floriculture scientist.

A major floriculture focus for the Morobe Province is the annual Morobe Show run by the Morobe Province Agriculture Society. Growers compete in a wide range of categories in which small cash prizes are awarded. These are listed below:

- **Cut flowers other than orchids** (Annual, 1 bloom e.g.: Zinnia, Marigold, Aster; Canna, l head; Rose, Single garden bloom, freshly picked with foliage, side buds; Rose, single stem, cluster type; Pentas, collection 4 different colours; Anthurium, 1 bloom; Gerbera, single, 1 bloom; Lily, 1 bloom; Any other herbaceous perennial, 1 bloom or spray; Hibiscus, single, 1 bloom (rosa-sinesis hybrid); Hibiscus, double, 1 bloom (rosa-sinesis hybrid); Hibiscus, any other variety, 1 bloom; Frangipani, collection of 3; Ixora, large leaf variety, 1 head; Ixora, small leaf variety, 1 head; Ixora, collection of 3 different colours; Bougainvillea, single, 1 stem; Bougainvillea, double, 1 stem; Bougainvillea, double & single, 3 stems, all different; Mussaenda, double & single, 1 stem; Any other flowering shrub, 1 stem; Any other flowering tree, 1 stem, (e.g. Cassia); Allamanda, shrub type, 1 spray; Allamanda, shrub type, 1 spray; Heliconia psittascorium group, 1 head (not over 0.5m long); Heliconia Erect lobster claw group, 1 head (not over 0.5m long); Heliconia Pendent lobster claw group, (not over 0.5m long); Heliconia any other, erect, 1 head (not over 0.5m long); Torch Ginger, 1 head (not over 0.5m long); and any other Ginger, 1 head (not over 0.5m long).
- **Foliage, shrubs and decorative plants** (Collection of 3 Crotons - all different; Acalypha - one stem; Aralia - one stem; Cordyline - one stem; Any other foliage Shruh or plant – stem; Collection of any 3 foliage).
- **Floral art** (Petite arrangement - not larger than 20cm x 20 cm; Foliage in a basket; Multi coloured mass; 3 flowered arrangements with foliage).
- **Orchids** (Vanda, terete - one spray; Arachnis Maggie Oei - one spray; Arachnis, other varieties - one spray; Aranda - one spray; Any other Arandanthe, or allied hybrid - one spray; Dendrohium - one spray; Cattleya - one spray; Spathoglottis - one potted plant in flower; Any other native species - one spray; Any other hyhrid orchid - one spray)

The range of floriculture categories at the Show is an indication of the rich diversity of the ornamental horticulture base in the Province.

Port Moresby (National Capital District)

Port Moresby and the surrounding areas are dry and harsh and not naturally well suited to growing horticultural products. The high temperatures and lack of rainfall make for a harsh climate for many plants. There is one small commercial grower of tropical cut flowers (gingers, heliconias and anthriums) situated 10 km outside Port Moresby. Tropical cut flowers and orchids are also commercially grown at the Port Moresby National Botanical Gardens. Some Highland households in the settlements along the Sogari road (10 km outside Moresby) grow ornamentals as a source of cash income. They sell on the roadside and at monthly craft markets.

Figure 5: Participants at Port Moresby stakeholder meeting

A stakeholder meeting was held at the National Research Institute Conference Room on July 20th. In attendance was the President of the PNG Floral Arts Society, the former Director of the Port Moresby Botanical Gardens, three growers, two florists, youth group members and representatives the National Training Council.

The stakeholder meeting highlighted the lack of markets for floriculture products, noting that flowers and ornamentals were not sold in the Gordon and Koki municipal markets and that the development of these markets needs to be encouraged. Participants at the meeting stressed the need for training – both in the growing and arranging of flowers. There were expectations that this would be provided through the PNG Floral Arts Society, now that government had indicated willingness to contribute financially to the group.

Local marketing

In Port Moresby there is a small but growing floriculture marketing segment emerging. There are now five flower shops operating in the national capital. The florists use both local and imported cut flowers. Linden Blossom[30] was established more than a decade ago by a Dutch couple who are long term residents of Port Moresby. “The Flower Shop"[31] is an arm of the National Capital Botanical Gardens and sells only locally sourced flowers. The value of sales from the Flower Shop is reported to be between 10, 000 and 15, 000 kina per month. The main market for these flowers is weddings and conferences (particularly larger international and regional events). Demand tends to be higher in the second half of the year, when weddings are more frequent. The Botanical Gardens also has a tropical garden nursery with a range of potted plants for sale. The “PNG Gardener” has a flower shop in its garden supply outlet. Both cut flowers and potted plants are sold.

[30] *lindenblossom@global.net.pg*
[31] *ncbg@orchidspng.com*

An important recent development has been the establishment of flower shops in the two largest up-market supermarkets. Orchids in Bloom Ltd. have a flower shop at Gordons Food World. Exotic Blooms have their outlet in the Andersons supermarket. Exotic Blooms have been sourcing cut flowers and foliage from grower groups in the Eastern Highlands and occasionally from the Western Province. One of the participants at the stakeholder meeting is the leading flower arranger and operates her business from home.

There are no commercial florists reported to be operating in other urban centers. However, certain growers in Lae, Goroka and Mount Hagen supply flowers arrangements to selected hotels and business houses.

There is no wholesale market for flowers operating in PNG. This marks a significant difference with the situation described for Fiji, where the establishment of a wholesale market has been the driving force in the development of the domestic market for cut flowers.

The selling of flowers and plants in municipal markets is not a feature in PNG, unlike the situation described for Fiji and that which exists in Honiara and Port Vila. The absence of these markets poses a major barrier for micro enterprises wishing to enter the floriculture industry and is a major constraint to the development of the domestic floriculture market.

The main outlet for small growers around Port Moresby is road side sales and the monthly Ella Beach craft market. The Ella Beach Market has become a significant event that is growing. At the time of a visit to the Ella Beach Market in July 2007, there were 15 sellers of pot plant and cut flowers. The vendors were selling flowers and pot plants they had grown themselves. There were no middleman participants at this market. Most sellers came from settlements around Port Moresby and this was their main market outlet. These sellers reported that they earned K100 to K250 after deducting their entry fee and transportation costs. The large cemetery on the Sogari road approximately 10 km outside Moresby is another popular selling spot. The main customers were middle class people who drove out from Moresby to purchase plants. Weekly gross revenue was reported to range from K20 to K120. Some had regular customers come to growers small home nurseries.

Figure 6: Pot plant sellers on the Sogari Rd and heliconias at the Ella Beach craft market

Export marketing

From time to time there have been attempts to export tropical cut flowers and foliage from PNG. The most ambitious effort was in May 2003 when a test shipment of floriculture products (lilies, heliconia, gingers, celosias, orchid and cordylines) was made from Goroka in the Eastern Highlands to the Flower Auction House at Aalmsmeer in Holland. This trial was sponsored by the Eastern Highlands Province Governors Office. The shipment

arrived at Aalmsmeer in good condition. It was the cordyline leaves that created the most interest. The trial proved that a long distant shipment from the Highlands to Europe was technically feasible. The trial, not surprisingly, pointed to a number of problems that had to be addressed before commercial shipments could be contemplated. In the eyes of the promoters, none of these problems are seen as insurmountable (Blake, 2003). The report on the trial shipment concluded that:

Exotic leaves, particularly some belonging to the cordyline (ti leaf) family, were identified as the best starting point for floriculture exports. These leaves are robust and easy to pack. They are reported to be in strong demand and yield a very efficient weight volume ratio for air-freighting. Yet air freighting to Europe remains a risky and high-cost business with trans shipment first to Port Moresby and then Singapore (Blake, 2003).

It was hoped that the apparent success of this test shipment would provide the stimulus for the substantial floriculture business involvement necessary for successful export development. The vision of the promoters was that a floriculture nucleus enterprise would be established in the Goroka District. The nucleus enterprise would be responsible for all aspects of market development and marketing. The flowers would be grown by small holders under contract to the nucleus who provide supervision and direction. However, such investment is yet to materialise. A Singaporean investor is currently discussing a joint venture in rose development with the Komiufa Growers Group in the Eastern Highlands.

More recently there have been less ambitious efforts to export cordyline leaves to Australia. Exotic Blooms made a trial shipment of a selection of cordyline leaves to Melbourne in July 2006. The shipment was rejected by the Australian Quarantine. Live insects were found in the consignment and leaf stems were not denatured in accordance with AQIS requirements[32]. Exotic Blooms reports that these quarantine issues have been resolved and they have an approved quarantine treatment and they are ready to recommence shipments.

6.2.2 The indigenous orchid segment

A viable commercial orchid industry has yet to be established in PNG despite the size a diversity of the resource and the substantial international demand that has been identified.

The indigenous orchid resource

PNG has more indigenous orchid species than any other country in the world (Queensland Herbarium, 2007). The island of New Guinea is the center of distribution for orchids from two major genera Dendrobium and Bulbophyllum (www.orchidspng.com). Overall the country accounts for around 10% or some 30,000 of the world's known orchid species (www.orchidspng.com). Amongst the PNG species is the world's largest orchid (*Grammatophyllum papuanum*).

[32] *From AQIS website www.aqis.gov.au*
1. All propagatable cut flowers must be devitalised. Devitalisation may be undertaken in the country of origin by AQIS accredited treatment facilities, or on arrival in Australia. The list of accredited offshore devitalisation treatment facilities is provided below.
2. AQIS will monitor the effectiveness of all devitalisation treatments. Routine evaluation will be undertaken on samples of plant material collected from imported consignments, and where the treatment (either preshipment or on arrival at an AQIS approved facility) is found to be ineffective, AQIS will withdraw its accreditation or approval to conduct devitalisation treatments. Accreditation to treat will only be reinstated following identification of the cause of failure and appropriate corrective action.

PNG's reputation as a rich source of orchids dates back more than a century. The major pioneering, and the most influential, work on orchids in PNG occurred during two expeditions led by Rudolf Schlechter (one in 1901-2 and the other in 1907-8). With a majority of the land and islands of German New Guinea inaccessible Schlechter collected from the islands of New Ireland and New Britain, and on the New Guinea mainland in the vicinity of Aitape, inland from Astrolabe Bay, the western end of the Finisterre Range to the Ramu River, through the Bismarck Range to an altitude of 2,000 meters. The early findings of Schlecter are described in his famous work, Die Orchidaceen von Deutsch Neuguinea. It would be nearly another 50 years before the rich orchid source of the Highlands was discovered (www.orchidspng.com). During the period 1919 to 1923 Schlecter described numerous other species collected by other botanists. During this same period taxonomic work was being done in the then Dutch New Guinea by J.J. Smith, who described many species collected by others (1909-1930) (www.orchidspng.com).

The success of the *Orchidaceae* within New Guinea and its adjacent islands is the result of adaptation to diverse ecological conditions. The Papua New Guinea Orchid News website notes that although New Guinea shares species from adjacent regions, it is the wide range of diverse habitats that has resulted in members of the family becoming specialised and PNG has become richly endowed with endemic orchids. Many of these orchids are horticulturally attractive and/or are of considerable botanical interest. As a consequence PNG orchids have been highly sought after and extensively exploited for over a century. Unfortunately, as lamented by www.orchidspng.com there has been little or no benefit to PNG's rural people. There is now an opportunity to reverse this situation that is both commercially viable and environmentally sustainable.

Since Schlechter's time research of the Orchidaceae of New Guinea has been described as sporadic at best (www.orchidspng.com). As a result PNG's *Orchidaceae* is much less researched and understood than those of SE Asia or Central and South America. Ed de Vogel & André Schuiteman (2005) note that "surprisingly, only very few orchidologists worked on this amazing orchid flora, and about 90 percent of all species were described before World War II by only 5 specialists[33].

More recent times have seen some resurgence in PNG's orchid research activity. The Singapore Botanic Gardens and the National Herbarium of the Netherlands has carried out extensive work on describing PNG's lowland orchid species. This culminated in 1995 with the publication by Singapore Botanical Gardens of Peter O'Byrne "Lowland Orchids of Papua New Guinea"[34].

The National Herbarium of the Netherlands, is collaborating with the National Capital Botanical Gardens in Port Moresby, in the publishing of a series of CD ROMs that will eventually contain all known orchid species. This work has been supported by the PNG

[33] *New Guinea Orchids and the project "Flora Malesiana: Orchids of New Guinea on CD-ROM" Ed de Vogel & André Schuiteman Nationaal Herbarium Nederland, Leiden, The Netherlands.*
[34] *This 584-page book deals with some 269 species covering 55 genera. A review of this book described it as a massive undertaking in itself, is a bold start in making known to the orchid world the unusual and spectacular orchid flora of Papua New Guinea.*

Department of Environment and Conservation. To date, two CD ROMs have been produced and three more are in progress. As part of this collaboration, two field inventories were made in 2003 which resulted in approximately 2,000 live orchid collections (Vogel & André Schuiteman). Wolfgang H. Bandisch, former Director of the National Botanic Gardens, reports that some 2,000 named images have been added to the collection with another 3,000 or so to go.

CITES and PNG Orchids

All PNG orchids are covered by Appendix 2 of CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora). CITES is an international agreement between governments that aims to ensure that international trade in specimens of wild animals and plants does not threaten their survival. PNG and most other Pacific island countries are members of CITES. The trade in PNG orchids is regulated by a 2003 Act of the PNG Parliament. The export of wild collected plants is strictly prohibited. Under current regulations export of indigenous orchid plants is only permitted if they are second generation hybrids (F2) which were originally propagated from seed. These requirements preclude the viable commercial production of orchids due to the infrequency of flowering in the wild and the long lead time required for propagating from seed. Genuine New Guinea orchid plants, which are in high demand, are difficult to obtain from legal sources. There are some reputable nurseries and laboratories where genuine Papua New Guinea species and hybrids can be sourced by collectors[35]. Orchid conservation has been unsatisfactory in spite of efforts since 1990 to enforce the ban on the removal of adult plants from the country. This valuable resource is being degraded due to loss of habitat and over-collection of certain species driven by the illegal export of plants. Yet, the commercial and environmentally sustainable development of PNG indigenous orchids for the benefit of rural people is seen as a readily obtainable objective.

The orchid growers

The only legal income currently generated by rural people from indigenous orchids is from small scale eco tourism activities and from plants sales to local collectors. There are currently no commercial growers of indigenous orchids. In the past there were commercial orchid nurseries operating in PNG. However, these are no longer viable under PNG's CITES regulations. The administration of CITES in PNG, as was found to be the case in Fiji, has inhibited the sustainable commercial development of the resource. This has had an unintended negative consequence of endangering rather conserving rare species.

A visit was made to Niugini Highlands Orchids (NHO), an eco-tourism enterprise that operates outside Mount Hagen. This community based enterprise was established in 1997 following a visit by the founder to the Fuji Orchid Show in Japan. The enterprise has on display a collection of 115 wild indigenous orchids at Mt Kuta some 10 kilometres outside Mount Hagen Township. Orchid enthusiasts pay to visit this site and can also take an escorted visit into the wild

[35] *http://www.orchidspng.com/nurseries.html recommends Stockers' Nursery Malanda, Qld., Australia (gstocker@austarnet.com.au); Royale Orchids Peats Ridge, NSW, Australia (info@royaleorchids.com); Burleigh Park Orchid Nursery Thuringowa / Townsville, Qld, Australia (info@speciesorchids.com); Mountain Orchids North Ludlow, VT, USA (info@mountainorchids.com) .*

habitat to view orchids. NHO is seeking funding to expand and diversify their operations; the first component involves construction of a nursery located near the Mt Hagen Kagamuga airport. Considerable scope has been identified for expanding eco-tourism income generating activities linked to indigenous orchids.

The marketers

The trading in indigenous orchids is largely limited to supplying the illegal export market. According to Barnabos Wilmot (Manager Wildlife Enforcement Department of the Environment) the smuggling of indigenous orchids out of PNG is rampant, with an estimated detection rate of about 1 percent. This situation is a reflection of the very high demand for PNG's indigenous orchids and the lack of resources devoted to the enforcement of CITES. There is no detection infrastructure or equipment at the air and sea ports. The apprehension of smugglers depends on the Department of the Environment receiving "tip offs" from the public.

Under a collaborative program between the National Herbarium of the Netherlands and the PNG National Capital Botanical Gardens, there has been CITES compliant shipments of orchids from PNG. In 2003, under this program, "pickled" specimens were exported to the Leiden University where they were grown and eventually flowered for photographing. However, an overwhelming amount of paperwork was required to make these shipments, which is not compatible with the development of commercial orchid exports.

The conservation and the commercial development of PNG indigenous orchids

New Guinea orchids have been collected by botanists and collectors for more than a century. Yet very little is known about the conservation needs of most of the genera and species. According to Wolfgang Bandisch, this lack of understanding is due to inadequate information on the distribution, habitats and biology of orchids. The need to establish an orchid industry based on a flora conservation program is not being addressed. The potential and requirements of indigenous orchids appears not to be appreciated leading to inadequate government commitment and funding. Overall, there would seem to be a lack of appreciation by policy markers of the potential economic value of minor forest products such as indigenous orchids and the positive relationship between the economic utilisation of the resource and the conservation of the resource.

A "loss-loss" situation currently prevails with the development of PNG's indigenous orchids that provides no benefits to PNG's rural people and is depleting rather than conserving the resource.

- PNG's unique and valuable orchid resources are being smuggled out of the country due to lack of border control resources to enforce CITES. These smuggled orchids are then available for rapid multiplication through tissue culture and an income opportunity is lost forever for the people of PNG.
- The restrictive administration of PNG's CITES regulations preclude the opportunity of rural people legally making an income from their orchids. Thus, they have no financial interest in preserving the resource other than supplying the illegal trade.

The current policy needs to be adjusted to allow for the use of efficient propagation methods that do not threaten the survival of the species as required by CITES. Rather than being an insurmountable constraint to commercial development of the PNG indigenous orchid industry, CITES offers a major opportunity if the appropriate policies are adopted and implemented. The policy environment should encourage the propagation of orchids under laboratory conditions from which F1 and F2 hybrids could then be developed for export markets. These hybrids would be unique orchids certified under the provisions of CITES, which would give them a unique marketing advantage. The

frequency of visits by Japanese orchid enthusiasts is a reflection of the potential market interest in such orchids.

According to PNG Orchid News, an orchid conservation project built around commercial development was designed several years ago. The proposed project promoted the protection of Papua New Guinea's floral diversity by establishing a gene pool for endangered species of orchids and other flora (www.orchidspng.com). The intention was to establish laboratory facilities for research support for the project. This central facility was to be involved in the collection, storage and artificial propagation of plants. The project was to develop an export market for propagated plant species, conforming to CITES regulations. A major focus of the project was to assist in the development of village based horticultural farms to produce foundation seed and hybrid orchid plants on a commercial basis. The hybrid orchid plantlets would need to come from a central tissue culture laboratory from where they could be distributed to out-growers who would then grow them to marketable size. It was envisaged that the grown plants would then come back to a central facility for finishing and distribution to the market. The PNG Orchid News reports that the project eventually “got lost in the bureaucratic quagmire”. This scoping study explores ways that this project concept might be moved forward to implementation. Such a project would seem to be particularly important, in terms of its rural income generating potential and contribution to conservation of PNG’s indigenous orchid resource.

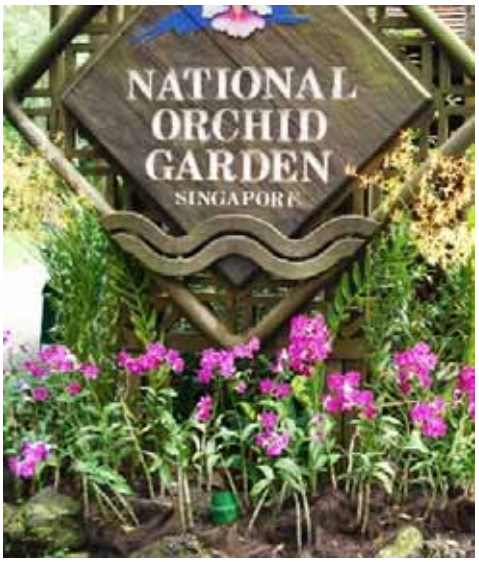
Indigenous orchids and the state of the Botanical Gardens

The depletion of PNG’s indigenous orchid resource and the absence of programs to develop a commercial industry based on resource conservation is reflected in the poor state of PNG’s Botanical Gardens, particularly the National Botanical Gardens (NBG) in Lae.

Figure 7: Existing infrastructure at the Lae Botanical Gardens

The National Botanical Gardens (NBG) covers an area of 56 hectares and is now administered by the National Forest Institute (NFI) The Lae NBG began development at its current site in 1949. In conjunction with the National Herbarium, these gardens became a consolidated centre for botanical research, education, and recreation. Throughout the 1960s and 70s, the NBG was renowned nationally and internationally. It became a major tourist attraction and an attractive recreation area for the residents of Lae.

A significant proportion of the estimated 3, 2000 known PNG orchid species were held at the NBG. Every year, the NBG mounted an orchid expedition to different parts of the country to bolster its collection. However, during the 1980s the condition of the Gardens rapidly declined in the face of massive budget cuts and changes in managements. As a result, within a few years the status of the NBG changed from a "world class botanical reserve to a poorly maintained park in a state of disrepair and neglect" (National Botanical Gardens Development Plan 2000)[36]. The orchid collection was substantially depleted and collection expeditions no longer held. Over the last few years there is reportedly some improvement in the state of the gardens with a modest increase in the funding allocation, although well below that proposed NBG Development Plan. The state of PNG's Botanical Gardens still remains well below their former glory.



What appears not to be realised by decision makers is that a well managed and funded botanical garden has the potential to generate substantial economic social and environmental benefits and as such represents a good investment of public funds. The experience of Singapore shows how important a thriving Botanical Gardens is in the development of an ornamental horticulture industry and the contribution such an investment can make to tourism, recreation amenity and education.

The National Orchid Garden is a main attraction within the Singapore Botanical Gardens. It has a collection of more than 1,000 species and 2,000 hybrids of orchid. The Singapore Botanical Gardens is a major international center for orchid research and breeding. It is noted that Peter O'Byrne "Lowland Orchids of Papua New Guinea" is published by the Singapore Botanical Gardens.

It is envisaged that a revitalized Lae Botanical Gardens could play a central role in the artificial propagation and hybridisation of indigenous orchids for commercial development along the lines proposed above. The implementation of the National Botanical Gardens Development Plan is seen as a priority in the development of the PNG ornamental horticulture industry and in particular the indigenous orchid industry. Apart from the social and environmental benefits, such an investment could be expected to give a high rate of economic return.

6.2.3 Trade in floriculture products

PNG's trade in floriculture products is minimal. According to the UNSD Comtrade Database, there were no official exports of floriculture products from PNG over the period 2002 to 2005. Over the same period, the database shows the value of floriculture product imports to be only USD32, 529. Discussion of these data at the Port Moresby stakeholder meeting revealed that some trade in floriculture products is not captured in the UNSD database. Internal Revenue Commission (IRC) data indicates a much higher levels of floriculture product imports (in 2004 10 tonnes of floriculture products were imported valued at around kina 140,000.) Ironically, a high percentage of these import are orchid plants from Singapore and Thailand that are sold at Port Moresby's annual International Orchid Show.

[36] *The Development Plan for the PNG National Botanical Gardens, Lae. Prepared by Roderick Spivey 2000.*

6.2.4 Economic contribution of the ornamental horticulture industry

The above discussion shows that ornamental horticulture, despite its considerable potential, contributes to the livelihood of only a small number of households in rural and peri-urban areas. At present, the industry makes not contribution to PNG's export earnings.

6.3 An assessment of PNG's comparative advantage in development of a substantial ornamental horticulture industry

On the face of it, PNG is a country that should be well placed to develop substantial horticultural export industries, including ornamental horticulture. PNG has a favourable climate, comparative abundance of land and labour as well as reasonably good water resources. The agro-ecological factors of the country make it suitable for the production of a wide range of ornamental plants and cut flowers on a year-round basis.

A brief assessment is provided below on the key determinates of PNG's comparative advantage in the development of a substantial ornamental horticulture industry. These determinants are:

- the agro-ecological environment
- market opportunities
- physical infrastructure
- the financing environment for agribusiness
- the policy environment
- the institutional environment.

6.3.1 The agro-ecological environment

Having a suitable agro-ecological environment is a fundamental necessary condition for establishing a substantial ornamental horticulture industry. There are sizable areas of PNG that meet this necessary requirement.

The range of altitude, temperature and soil variability of the country has created an enormous ecological diversity and a huge wealth of biological resources. Notable among the resources of PNG is the native vegetation. There are reported to be over 250 plant families in 1500-odd genera and some 15 to 20,000 species of vascular plants, of which over 50 percent of the plants are only found in PNG? (Muller, 2001)[37]. Variations in topography, rainfall, and vegetation cover provide an almost endless range of habitat for plants and the orchid flora. Generally speaking, each major type of habitat has its own orchid flora. Some species are widespread in area of similar habitat; others are confined to a very restricted locality (www.orchidspng.com).

The highland regions of PNG offer the best potential for horticulture and floriculture development. Parts of the highland region provide ideal conditions for growing temperate vegetables and flowers. At elevations of around 2,000 meters, the year round range of day time temperature is 22 to 30^{o}C and the night time temperature range is 6 to 12^{o}C. In most locations, at this elevation, there is considerable solar radiation. Rainy days are usually restricted to less than 100 per year. These are almost identical conditions to those found in the highlands of East Africa, Ecuador and Colombia, which are amongst the world's leading floriculture regions.

[37] *The Biodiversity in New Guinea by Kal Muller www.papuaweb.org*

The areas most suited to growing temperate horticulture crops are in the Western Highlands and Eastern Highlands. This is due to a combination of ecological conditions, population pressure and accessibility. In both areas, active interest in floriculture development was identified.

In the Western Highlands, the locations most suited to floriculture development are in the Mount Hagen District. The upper Wahgi, Kuna and Komun valleys have the most potential given the suitability of land, lack of agricultural pressure and reasonable roads providing access to markets (Papua New Guinea Rural Development Handbook 2001). The valley bottoms are at an elevation of 1,500 masl, with average rainfall ranges between 2500 and 2800 millimetres (Papua New Guinea Rural Development Handbook, 2001).

The Eastern Highlands Province of PNG is located in the central highlands and includes an area of around 8900 km2. Within the Eastern Highlands, it is the flood plains of Asaro Valley of the Goroka District that is well suited to temperate horticulture and floriculture development. The Asaro Valley lies at an altitudinal range of 1400-1600 masl, with an average rainfall ranges between 1800 and 2800 mm and there is a moderate dry season (Papua New Guinea Rural Development Handbook, 2001). The town of Goroka is in the middle of the district and well connected to Mt Hagen and Lae by the Highlands Highway. Most people in the occupied areas of the district benefit from relatively good road networks connecting them to the town of Goroka in less than an hour's drive. There are number of village based groups active in floriculture development in the District.

An overview of suitable conditions in the tropics for ornamental horticulture[38]

If one takes a global geographic view of the area in which Latin American and East African cut flower production is presently established, it is clear that there exists an Equatorial Belt approximately 19° latitude north and south of the Equator. Within this narrow latitude zone the following conditions favour cut flower production:

- Up to a minimum of 1700 hours of brilliant sun per year.
- Relatively stable and uniform diurnal day length and temperature rhythms.
- Absence of seasonal aspects of climate that require growing environment protection and modification controls, found outside these latitudes, permitting no more than simple plastic film roof structures.
- The potential to encounter the desired cut flowers ideal climate, by simply taking advantage of the phenomena of natural reduction of temperature with altitude.

(Zabeltitz, 1999)

For the production of plants, it is important to know the mean daily sum of solar radiation energy for each month. In the equatorial zone, the daily solar radiation is the same in the summer and winter, while the other zones show considerable differences between summer and winter.

The production of plant matter decreases almost linearly with radiation at low solar radiation values. Most important for photosynthesis, i.e. the growth of plants, is solar radiation power (W/m2). In the equatorial zone, solar radiation values do not drop below the minimum during the year. Plant growth in greenhouses is possible throughout the year. Flowering plant varieties are adapted to the day length. For tropical regions, varieties suited to the shorter day length in summer must be chosen.

[38] *This section draws heavily on work from FAO Plant Production and Protection Paper 154, Greenhouses and shelter structures for tropical regions by Christian von Zabeltitz, 1999.*

Although data on solar radiation power (W/m2) was not available for the regions of PNG discussed in this scoping study, Table 1 shows the total sunshine hours per year for the selected sites.

Table 1: Total sunshine hours per year at selected sites in PNG

	Sunshine hours (total per year)
Goroka	1764
Lae (Botanic Gardens)	2012
Mt. Hagen	n/a
Port Moresby	2478

Source: McAlpine et al., 1975

The cloud conditions and altitude above sea level produce significant deviations from the mean radiation distribution:

- Due to heavy cloud and high precipitation, the radiation in equatorial zones is constantly reduced. In regions with distinct rainy seasons, the decrease in radiation is limited to these seasons.
- With increasing altitude, radiation is intensified. Corresponding climatic conditions can be found, e.g. in the tropic plateaus of Ecuador, Colombia, Kenya and in this case PNG, near the equator.

Temperatures

The impact of temperature in any one location depends on radiation, season, altitude above sea level, distance from seas, and wind and cloud conditions. Therefore it is difficult to make general statements. For more detailed information, the local micro-climate of the location in question has to be examined. Very generally:

- Temperatures sink with increasing altitude above sea level. In tropic plateaus and mountains, temperature extremes do not change between summer and winter, but every 12 hours between day and night. In spite of high day temperatures, near zero temperatures can be reached during the night. This cannot be seen from the monthly means.
- The temperature amplitude grows with increasing distance from the sea.
- Extreme minimum temperatures can range below the biological optimum in highlands.

Table 2: Temperature data for selected sites in PNG

	Mean temp (deg C)	Mean max temp (deg C)	Mean min temp (deg C)
Goroka	20.1	25.7	14.6
Lae (Botanic Gardens)	25.9	29.6	22.1
Mt. Hagen	18.3	23.7	13
Port Moresby	26.8	31	22.6

Source: McAlpine et al., 1975

Precipitation

Water is a vital element for plant growth. In order to evaluate protected cultivation in a region, it is necessary to have information about the most important characteristics of rainfall, e.g., total quantity, seasonal distribution, intensity and frequency. The variability from year to year is also an important factor.

Together with precipitation, evapotranspiration is an important element, especially for the water supply (water balance) in open-field cultivation. In protected cultivations, the total water consumption of the plants is covered by irrigation.

Rainfall in tropical regions tends to occur in high intensities together with storms. Excess rainfall that the soil is not able to absorb flows away as surface run-off; it is not available to the plants and causes strong soil erosion. Generally speaking, rain intensities greater that 10mm/h are dangerous with regard to erosion. Such intensities, however, are a frequent occurrence in tropical regions.

Tropical humid climates suffer from intense rainfall, whereas sub-tropical climates have large areas with very little rainfall. Usually, rainfall shows the biggest variation where the total quantity of rain is smallest.

Table 3: Rainfall data for selected sites in PNG

	Avg. annual rainfall (mm)
Goroka	1921
Lae (Botanic Gardens)	4419
Mt. Hagen	2586
Port Moresby	1145

Source: McAlpine et al., 1975

Evapotranspiration

Evapotranspiration and its relation to rainfall is important for: the evaluation of plant growth; the calculation of water consumption for irrigation; and the need to collect and store rainwater for dry periods. Evapotranspiration is the evaporation of water from soil and plants. It depends on: solar radiation; air temperature; surface temperatures of plants and soil; the vapour-pressure gradient; wind and air turbulence; and the growth stage of the plants.

Unfortunately there was no data available for evapotranspiration in the selected regions of PNG evaluated in this scoping study.

6.3.2 PNG's agro-ecological environment for exotic tropicals

The coverage here is indicative and is restricted to anthuriums, gingers, heliconias, leaves and ferns.

Anthuriums

Anthuriums are native to the rain forests of South America. Thus they are well suited to the hot humid conditions that prevail along the coastal and lowland areas of PNG. The temperature range for anthuriums is between 14^{o}C and 35^{o}C, with an optimum day time temperature of about 22^{o}C. The upper limit of the acceptable temperature range depends on humidity. Good flowering requires high humidity. In the lower humidity conditions found around Moresby anthuriums will feel distinctly uncomfortable. Thus to successfully grow commercial anthuriums around Port Moresby would require measures to either reduce the temperature or increase the humidity. Anthuriums need semi shade conditions. Too much light can cause the colours to fade. If there is little or no shade the leaf temperature will be well above the air temperature causing the leaf to burn and plant growth to be slowed.

The climatic conditions around the Lae area are comparable to those found in Suva and Mauritius. Mauritius is the world's largest anthurium exporter located in the tropics. Suva is the nucleus of anthurium production in Fiji. The range between daily maximum and minimum temperatures is almost identical for Suva and Lae (Table 4).

Table 4: Temperature comparisons – Suva and Lae

	Mean max temp (deg C)	Mean min temp (deg C)
Suva	29.6	23.1
Lae (Botanic Gardens)	29.6	22.1

Source: Fiji Islands Bureau of Statistics
McAlpine et al., 1975

The Lae Botanic gardens recorded overall annual rainfall is slightly less than that recorded for Suva. Lae's hours of sunshine are nearly identical to that of Suva. Overall rainfall/humidity conditions in both locations can be regarded as optimum for anthuriums.

Table 5: Rainfall and sunshine comparisons – Suva and Lae

	Total hours of sunshine (Avg. annual)	Avg. annual rainfall (mm)
Suva	1911.5	3355.9
Lae (Botanic Gardens)	2012	4419

Source: Fiji Islands Bureau of Statistics
McAlpine et al., 1975

Gingers and heliconias

Gingers and heliconias require hot, wet conditions to flourish. Thus they do best in the lowland, high rainfall areas of PNG such as Lae. Lae with an average annual rainfall of 4419 mm and mean temperature of 25.9 deg C is an ideal location for ginger and Heliconia production. To grow gingers and heliconias commercially in the areas surrounding Port Moresby will require irrigation. These plants like lots of water and well-drained soils rich in organic matter. The minimum temperature must exceed 5 ^{o}C, where temperatures are not limiting; flowering is year-round if moisture and nutrition are adequate.

Dendrobium orchids

The conditions required for optimum dendrobium orchid production are:

- bright sunshine a high percentage of the time
- good drainage – native epiphytes in trees dry out within 15 minutes of rain
- warm day temperatures (between 24^{o}C and 30 ^{o} C with night-time lows not falling below 18 ^{o} C
- low to moderate rainfall not exceeding 10cm monthly
- good air movement but without regular strong winds
- a level site with good drainage.

These conditions are largely met in and around Port Moresby. In Fiji the dendrobium orchid growers are centred on the dry western side of the island near Nadi, where some of the better growers achieve yields comparable to that of Hawaii's growers. The climatic conditions of Port Moresby are compared to those found in Nadi below in Table 6. Generally speaking Port Moresby is a bit harsher than Nadi with regards to temperature and rainfall.

Table 6: Climate comparisons between Nadi and Port Moresby

	Avg. annual rainfall (mm)	Mean max temp (deg C)	Mean min temp (deg C)	Total sunshine hours
Nadi	1686.8	30.2	21.5	2555.9
Port Moresby	1145	31	22.6	2478

Source: Fiji Islands Bureau of Statistics
McAlpine et al., 1975

Dendrobium orchid yields in other areas of PNG such as Lae could expect to be quite low as is the case in Fiji where the production level of dendrobium growers in the Suva area is less than ½ that achieved by there Nadi counterparts. Dendrobium production in both Fiji and Hawaii experience considerable seasonal variation, with around a 50 percent reduction in yield experienced during the winter months (May through August in Fiji), the same seasonality can be expected in and around Port Moresby.

Potted plants and Leaves

The plant biodiversity found in PNG's forest is incredibly diverse. There also exists a wide range of climatic and ecological zones that provide the necessary conditions of plant growth for a plethora of different plant types.

Foliage leaves from many commercial varieties thrive in the high rainfall areas of PNG. Often these plants need little or no care and produce profusely their foliage. Apart from the leaves that are already used commercially it is assumed that are a great number of native plants found in the forest areas that possess the characteristics necessary to be good cut foliage.

Croton is a common garden plant found in landscapes around the country. It propagates very easily from cuttings and is tolerant of many types of soil. In the high rainfall areas of PNG this plant thrives with little or no assistance.

Climatic conditions in all growing areas of PNG are suitable for a variety of potted plants. Partial shade supplied by sarlon cloth is used in commercial nurseries while the majority of potted plant producers just grow under trees and around their compound.

A wide variety of palms are grown in PNG and almost all are well suited to the climatic conditions found here provided they are planted in the correct media. Commercial palm nurseries often benefit from being located in the high rainfall areas because this reduces the amount of hand watering.

Overall assessment

There exists excellent growing conditions for tropical's in the New Guinea lowlands and islands, in particular Lae is well suited for anthurium, ginger, and heliconia production. Areas around Port Moresby have potential for good potential for dendrobium orchid production.

6.3.3 PNG's agro-ecological environment for temperate cut flowers

The coverage here is indicative and is restricted to roses, tuberose, marigold, jasmine and carnations.

Roses

The majority of commercial rose varieties require a mild temperate climate for good yields, high quality and minimal pest and disease damage. In tropical countries these requirements are often met in the high altitude areas. It is at this altitude that the lower day and night time temperatures are found that are conducive to high quality rose production.

Parts of the PNG highland region provide ideal conditions for growing roses. The elevation of the two climate recording sites in Goroka and Mt. Hagen is 1565 meters above sea level and 1630 meters respectively. Christian von Zabeltitz, in 'Greenhouses and shelter structures for tropical regions' reports: "at elevations of around 2,000 meters, the year round range of day time temperature is 22 to 30^{o}C and the night time temperature range is 6 to 12^{o}C. In most locations, at this elevation, there is considerable solar radiation. Rainy days are usually restricted to less than 100 per year. These are almost identical conditions to those found in the highlands of East Africa, Ecuador and Colombia, which are amongst the world's leading floriculture regions."

Rose production in the lowland areas and islands of PNG will face substantial constraints due to the climate associated with these areas. The hot and moist conditions that are found in these areas while presumable lead to higher than usual downey mildew pressure which is limiting factor to high quality rose production.

Tuberose

Tuberose prefers to grow in an open sunny location, away from the shade of trees. It requires warm and humid climate although flowering is profuse under mild climate. Under extremes of high (>40° C), or low temperatures the spike length and the quality of the flowers is severely affected. A temperature range from 20-30° C is considered to ideal for this crop. A place protected from strong winds is preferable. The climate in Goroka and surrounding areas is well suited to tuberoses.

Marigold

Marigold requires a mild climate for luxuriant growth and flowering. The optimum temperature range for its profuse growth is 18-20° C. Temperatures above 35° C restrict the growth of the plants, which leads to reduction in flower size and number. In severe winter, plants and flowers are damaged by frost.

Jasmine

Jasmine prefers a mild tropical climate. Jasmine is commercially grown in India under open field conditions. The ideal requirements for successful cultivation of jasmine are mild winter, warm summer, moderate rainfall and sunny days. Jasmines grow well up to 1200 m. A well-distributed annual rainfall of 800 to 1000 mm is optimum for growth and development.

Carnations

Land between 2,500 and 4,000 feet in elevation is suitable for the year-round production of carnations. Water supply must be considered in land selection for carnation production. Carnations are best grown at an even temperature, as fluctuations accentuate calyx splitting. Goroka and Mt. Hagen districts would have areas that are suitable for carnation production.

Overall assessment:

Available evidence indicates that world class production conditions exist for temperate cut flowers in some Highland locations.

6.4 Market opportunities

6.4.1 Exotic tropicals

Export markets

Tropical products are estimated to make up 4-5 percent of the total floriculture trade valued at approximately € 400-500 million annually, of which orchids and anthuriums make up 90 percent of this trade. Leonhardt (2006) identifies good growth in demand for tropical floriculture products in travel and tourism; luxury hotels, resorts and restaurants. However, a study by Rikken (2006) on the market for tropical flowers and foliage in the European Union would suggest there would be little opportunity for a remote new entrant such as PNG obtaining a market share. The Rikken study found that there is worldwide overproduction of tropical flowers, with some importers moving away from tropical flowers because of decreasing prices and lack of demand.

The 2003 test shipment of tropicals from Goroka to Aalmsmeer in Holland shows that it is technically feasible to export cut flower to Europe. However, air freighting floriculture products from PNG to Europe would be a risky and high-cost business in comparison to competitors in Africa and South America. There would seem to be little justification for European importers to look to remote PNG as an alternative source of supply. Thus it is hardly surprising that there has been no follow up interest in PNG as a supply source since the once off shipment in 2003. This is despite the high expectations of the promoters and the favourable comments made about the quality of the leaves that were sent.

There are market trends that in the longer term could potentially favour new entrants such as PNG. From 2008 onwards Kenya, under the Cotonou Convention, will lose its preferential access to the European Union. Kenya will not be classified as a “Least Developed Country” a category that will be retained by competitors such as Ethiopia, Uganda and Tanzania and presumably PNG. Kenya and Ecuador have been subject to increasing environmental and trade unionist pressure for its excessive and misuse of pesticides. A new entrant such as PNG has the opportunity to commence operations based on a more acceptable and certifiable set of environmental, health and safety standards.

More immediate markets for tropicals could be expected to lie closer to home in Oceania and Asia. Gingers and heliconias, from all sources, are excluded from the Australian market due to quarantine restrictions. However, even if these restrictions were lifted it is unlikely that gingers and heliconias grown around Lae could complete with the Darwin and N. Queensland based Australian industry. There is a very small market available for gingers and heliconia in New Zealand (PITIC, 2003). However, nearby Fiji and Samoa send minimal volumes of gingers and heliconias to New Zealand. For PNG, without direct flights to New Zealand accessing these markets cannot even be contemplated.

Exotic Blooms’ report to the ADB SSCF Pilot Floriculture Project indicates a readily available market in Australia for exotic leaves from the Highlands. This market was estimated at around a tonne a week[39]. The report also records the availability of significant markets in Europe. Exotic Blooms optimistic view is not supported by the Sydney based Pacific Islands Trade and Investment Commission (PITIC) who did an assessment of floriculture shipments from Fiji and PNG[40]. The PITIC report found that the landed price from both countries was more than 50 percent to 200 percent higher than Australian

[39] *Exotic Blooms “Report on the ADB SSCF Floriculture Project for Notofana Womens Group and Gipaheka Womens Group in Goroka, Eastern Highlands, August 2006.*

[40] *Robyn Ekstrom: Coordinator - Export and Enterprise Development Pacific Islands Trade and Investment Commission: robyn.ekstrom@pitic.org.au*

wholesale prices. PITIC reported major issues in volume, consistency of supply and quality (species, colours, sizes, post harvest handling and packaging) and noted that "post-harvest handling, refrigeration and cool chain integrity needs to be established or we can forget it" (PITIC, 2003). The PITIC identified very few importers even interested in dealing with Pacific islands and even for those interested the volumes were seen as too low and risk is perceived as too high compared with Asian suppliers. A typical reported reaction was "why drop an established Asian supplier that provides the right product at the right price every week" (PITIC, 2003).

Japan probably offers the best potential prospect for tropicals. Japan is one of the world's largest flower importing countries[41] – with niches available for high-quality exotic flowers. There is a direct flight Port Moresby to Narita, thus shipments would be feasible. It is also of note that a Singaporean investor is discussing a joint venture in rose development with the Komiufa Growers Group in the Eastern Highlands. Again shipments are feasible with Air Niugini operating a direct flight from Port Moresby to Singapore.

Figure 8: Heliconias and foliage for sale at the Japanese auction house

Domestic markets

It is the domestic market that in the foreseeable future offers the best demand prospects for tropical cut flowers and foliage. In PNG, the local market demand is seriously constrained by the absence of a wholesale market, erratic supply, and high prevailing prices. The Fiji scoping study showed that the establishment of a wholesale market has allowed the entry of new floriculture businesses that have driven market development. The narrow local market experiences unpredictable highs and lows related to special life cycle events – deaths, births and marriages. However, with the development of a wholesale market, florists in Fiji have been able to secure contracts with local businesses and churches to overcome these fluctuations in demand. The development of wholesale markets in PNG could be expected to have a similar positive impact on the demand for floriculture products.

The total potential market for tropical cut flowers and foliage is estimated at several million kina. This estimate is based on the Fiji experience - adjusted for the population, income level and income distribution.

[41] *In 2003 Japan imported 34,000 tonnes of floriculture products valued at 23,690 million yen (JETRO 2003)*

6.4.2 Temperate cut flowers

If temperature flowers such as roses were readily available at a reasonable price, a worthwhile domestic market could be expected amongst the growing urban middle class. Exotic Blooms has imported roses from Australia for Valentines Day.

Exports of temperate flowers from PNG would likely be sent to Asia. Japan is a major importer of cut flowers with over 1.6 million Euros traded in 2001 (AIPH / Union Fleurs: International Statistics Flowers and Plants 2006). This same source records over 57 countries that exported cut flowers to Japan in 2001.

6.4.3 Indigenous orchids

An indication of the interest in PNG's indigenous orchids is seen in the Papua New Guinea Orchid News website, launched on Oct 25 1998, which has had over 2.3 million visits. The popular interest in PNG orchids is also reflected in a feature in the Qantas/Air Pacific in-flight magazine (August 2007) under the banner "Orchid Delight: PNG sets scientific pulses racing". To quote:

The previous WWF expeditions to the Kikori region surrounding Lake Kutubu discovered some 300 species many of these have been confirmed as new species. The orchids collected by this group varied enormously in terms of size, shape and colour – we have found tiny orchids with flowers only a couple of millimetres in diameters to those with flowers several centimetres across.

The market for PNG indigenous orchids can be divided into two broad segments:

- "bringing the world to PNG orchids" (the eco-tourism market – which is not dependent on CITES compliance)
- "sending PNG orchids to the world" (the export market – which is dependent on CITES compliance).

"Bringing the world to PNG orchids" (eco-tourism)

Over the last decade, over 2-million people "have come to PNG orchids" via the magnificent Papua New Guinea Orchids News website that was developed by Wolfgang H. Bandisch, former Director of the National Botanic Gardens. This has created significant awareness on a potential global market. A fraction of these people have been attracted to visit PNG and to observe these orchids in their natural environment. Such visitors spend money in rural areas and provide an incentive to conserve the resource. If only one half of one percent of the people who visit the PNG Orchids website decided to visit the country to observe the orchids first hand, this would represent around 50, 000 visitors per year. This would make an immense contribution to the livelihoods of rural people.

Some of the orchid eco-tourists belong to a small but dedicated group of enthusiasts like those described in the June 2007 issue of the Orchadian. Entitled "What an Adventure: An Orchid Tour of Papua New Guinea," this excerpt from the article articulates the enthusiasm of the tour group:

The return trip to Ambua Lodge produced another surprise. A large tree had fallen along side the road, so we had to stop and see if any orchids were there, in this endangered environment. Most of the plants were dead but several were found alive and saved by returning them to the Ambua Lodge for replanting. Among the plants recovered were Dendrobium subacaule, Glossorhyncha species and others. There was also the surprise of finding unnamed species within the Latourea section of Dendrobium. Before leaving Ambua Lodge, we had another quick trip viewing orchids in the wild. Several unknown Bulbophyllum species were seen along with many spectacular Cadetia species, Calanthe species, Coelogyne fragrans, Dendrobiums cuthbertsonii, Dendobiums finisterrae, Dendrobiums subclausum, Dendrobium vexillarius and a Phreatia species with small

white flowers on very long inflorescences. On this walk were two 'wow' plants. Possibly an undescribed Coelogyne was the first plant seen. This plant with its bright yellow flowers and a beautiful red brown labellum must be closely related to Coelogyne fragrans. An undescribed Bulbophyllum was the second major find. This had grown into a clump about one metre square and was in full flower, forming a mass of white and orange, the sepals and petals were almost translucent to white the labellum was large and a vivid orange. Keeping in mind that many of the orchid species of New Guinea are described, from my observations and a search in Schlechter's Orchidaceae of German New Guinea I believe many more are yet to be described including this stunning species (Orchadian Vol 15, No 8, June 2007.)

However, for most tourists interested in PNG's natural environment, orchids represent another attraction along with birds of paradise, spectacular scenery and exotic cultures. There is no doubt significant scope for the expansion of eco-tourism in PNG, including tourism specifically related to orchids. This development will depend on more investment of the type proposed by Highlands Orchids (NHO) and more promotion of PNG's unique eco-tourism attractions. In the future, tourists and visitors might be able to purchase hybrid PNG orchid plants to carry back to their home countries as gifts and souvenirs of their PNG experience. The tourism "carry on" trade is a significant part of Hawaii's floriculture industry[42]. However, such a development will depend on having CITES compliant, and other phytosanitary, protocols in place. The development of this market is thus likely to be a by-product of the development of commercial orchid exports.

The overall development of the tourism based orchid market faces the same constraints that limit the growth in tourism numbers to PNG generally. These constraints include the poor market perception of PNG's law and order situation, air service and other infrastructure limitations. Total non-resident visitor arrivals are estimated to currently stand at only around 70, 000, compared with some 600,000 for Fiji.

Export markets for indigenous orchids

It is anticipated that it would be potted hybrid orchids that would be exported. The best market opportunities are identified for small plants with large flowers.

Rittershausen et al. (2001) in discussing the market for potted orchids notes:

…other dendrobiums, particularly miniature species from Papua New Guinea such as D. Cuthbertsonni are coming to the fore, being prized for their compact size and incredibly colourful flowers, and their willingness to produce good hybrid forms (p, 104).

Orchid collectors represent a significant niche market opportunity. However, it is expected that the main market for PNG potted hybrid orchids would be as upmarket household beautification items. The target would be high income consumers in large Asian cities who live in confined residential spaces. They will largely buy their potted orchids through supermarket chains which are increasingly providing the main outlet for floriculture products.

Small potted orchids, unlike cut flowers, are a relatively non perishable item. Thus the export of indigenous orchids would not face the almost insurmountable supply chain constraints faced by aspiring exporters of cut flowers and foliage from PNG. It would be a realistic option to devise systems that assembled orchid plants at Lae for direct sea freight to Asian markets. As such, the problem of cost and capacity of air freight is avoided

It will be difficult to enforce patents on plants once they have left the country. Thus it must be expected that any PNG hybrid that is popular in the market will be tissue cultured by a

[42] *In 2001 the value of "Hawaii Food and Floriculture Products" sold to departing tourists was $US102 million (Department of Business and Economic Development and Tourism).*

competing business. A sustainable market strategy for PNG will involve a combination of two components:

- The development of a certification program that would enable orchids to be sold as "genuine PNG sourced orchids".
- A breeding program in place that allows for the ongoing pipeline of new genuine PNG hybrids ready for introduction into the market. Being at least one step ahead of the tissue culturing by competitors is seen to be readily achievable. As noted in the White Paper on Agriculture, repeated sectional and intersectional crossing and backcrossing to generate newer types has almost limitless possibilities. PNG already has a significant number of primary orchid hybrids that would provide a basis for kick starting the development such an industry.

6.4.4 Physical infrastructure

Adequate physical infrastructure is also a basic necessary condition for the efficient marketing of perishable horticulture products. Epstein (1999) describes the inherent transportation constraints faced by the fresh produce industry:

The PNG varied topography with its mountainous areas that are interspersed with deep valleys, coastal plains and numerous islands create serious problems for an effective intra – country food distribution system. As there are no railways, PNG depends on road, sea and air transport. None of these transport means offer cost effective options to ensure satisfactory food supplies to Port Moresby. There is only one highway that links the Highlands to the coast and that ends in Lae; there is no direct road linking the Highlands with the capital. The lack of maintenance of the highway between Mt. Hagen and Lae has resulted in extreme deterioration of the road surface. This constitutes now a serious hazard to trucks and cars and in turn is reflected in the high transportation costs. Shipping between Lae and Port Moresby is not always regular and demand for space exceeds availability. This means that the quality of fresh produce deteriorates in Lae while waiting for shipment to Port Moresby. In principle the shipping of fresh produce by air from the Highland to Port Moresby is preferable in terms of ensuring quality maintenance, but in practice air connections are unreliable and airlines prefer to carry passengers rather than freight and therefore space is often not available and freights are prohibitively high (p. 18).

PNG, unlike the situation described in the East African floriculture areas, falls well short of meeting basic infrastructure requirements. Transportation constraints are likely to offset any advantages PNG may have in terms of agro-ecological conditions

Roads

The establishment of the Highlands Highway in the mid-1960s led to the establishment of the coffee industry, which is now the nation's most important industry. It also opened up the prospect of PNG having a major commercial produce industry taking advantage of the excellent growing conditions. However, the Highway has nowhere realized its potential due to inadequate maintenance, lack of supporting feeder roads and poor security. Encouragingly there is now a major upgrading program in place using national and aid funding. Secondary and rural feeder roads are often in a state of disrepair or non existence. However, rural roads in the Goroka District of the Eastern Highlands, an identified area for floriculture development, are relatively good. A major constraint is that there are no direct road links to the main Highland production areas, the main urban center of Port Moresby and the international airport. Fresh produce therefore must be transhipped by air or sea. This situation is unlikely to change in the foreseeable future

Overall assessment: Poor

Airfreight

The movement of cut flower products to markets depends on airfreight. Air Niugini provides a twice daily Dash 8 service in the main provincial centers, including Goroka, Mt. Hagen and Lae. AirLink a second tier airline also provides some scheduled services and there is a small air freighter that offers charter services[43]. In 2003, at the time of the trial shipment (floriculture products from Goroka to Aalmsmeer (Holland)), AirLink had plans to invest in a dedicated ATR42 aircraft to provide a freight service for ten tonnes capacity of cargo from the Highlands to Port Moresby. These plans have not yet materialised. The situation remains that the overall domestic airfreight capacity is limited; freight rates are high[44] and the quality of service is less than satisfactory. Exotic Blooms reports that consignments have been off loaded an average of once every two weeks. The Goroka stakeholder meeting for this scoping study had to be cancelled due to numerous flight cancellations. There are no cool store facilities available at any of the regional airports.

International air freight capacity is limited. There are currently daily Air Niugini flights (Boeing 767) from Port Moresby to Brisbane. The same aircraft makes weekly scheduled flights to Singapore and Narita, Japan. At present Port Moresby is PNG's only international airport. There are no scheduled freight services to and from Port Moresby.

Overall assessment: Poor

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[43] This is a single engine PAC 120 owned by Oilmin Field Service Ltd. It has a freight capacity of 1.2 tonnes and is chartered at a rate of K1,400/hours.

[44] Below are the current Air Niugini listed domestic air cargo rates. Relatively light floriculture products usually command a significantly higher volumetric rate. Exotic Blooms reports an Air Niugini freight rate of K7/kg for the transportation of floriculture products from Goroka to POM.

Air Niugini

March 2006

CARGO TARIFFS INFORMATION

DOMESTIC CARGO RATES - EFFECTIVE 27th MARCH 2006

Currency is Papua New Guinea Kina (PGK)

(TACT - Domestic)

RATES PER KILOGRAMS in PGK (KINA)

Basic Charge Per Shipment - Pgk 30.00

Rates are subjected to VAT 10%

ALOTAU	GUR																						
BUKA	9.50	BUA																					
GOROKA	5.65	9.85	GKA																				
HOSKINS	6.40	4.55	6.65	HKN																			
KAVIENG	8.25	4.75	8.65	2.95	KVG																		
KUNDIAWA	5.90	10.15	6.30	7.10	8.70	CMU																	
LAE	5.10	7.20	5.45	3.50	5.45	5.80	LAE																
LIHIR ISLAND	9.20	13.40	9.60	10.35	11.70	9.70	9.00	LNV															
MADANG	6.15	8.25	6.60	4.75	5.60	6.70	2.20	10.05	MAG														
MANUS ISLAND	8.05	5.95	8.40	6.35	3.30	8.65	4.45	11.90	5.15	MAS													
MENDI	6.65	10.90	7.10	7.80	9.40	7.20	6.45	10.45	7.45	9.20	MDU												
MOUNT HAGEN	6.20	10.45	1.80	7.40	9.20	6.85	6.00	10.15	7.10	8.95	7.60	HGU											
POPONDETTA	4.05	8.35	4.45	5.25	7.10	5.00	3.90	7.90	4.90	6.75	5.35	5.00	PNP										
PORT MORESBY	3.15	7.40	3.50	4.55	6.15	3.80	2.75	7.10	4.00	5.90	4.50	4.10	2.00	POM									
RABAUL/TOKUA	7.90	3.10	8.35	2.50	2.55	8.55	5.00	11.80	6.15	4.85	9.30	8.85	6.75	5.85	RAB								
TABUBIL	11.00	14.95	11.45	11.80	13.60	11.40	10.40	15.05	11.45	13.35	12.25	11.55	9.40	8.50	13.30	TBG							
TARI	7.20	11.40	7.65	8.40	9.85	7.75	7.10	11.10	8.05	9.65	1.65	8.15	5.95	5.05	9.85	12.85	TIZ						
VANIMO	9.30	11.30	9.70	10.55	7.65	8.75	9.15	13.20	4.40	5.35	10.70	10.25	8.15	7.20	9.20	14.65	11.25	VAI					
WAPENAMANDA	6.95	7.75	7.35	8.20	9.75	7.45	6.75	10.80	7.80	9.50	8.90	7.95	5.60	4.80	9.65	12.40	8.85	11.15	WBM				
WEWAK	7.65	9.65	8.10	6.40	9.15	8.30	3.85	11.60	2.85	6.90	9.10	8.60	6.45	5.50	7.90	13.00	9.60	2.75	9.45	WWK			

Telecommunications

A key element in the successful marketing of perishable products is the timely communication between growers, traders, buyers and transport providers. The great strides that have been made in telecommunications globally are now starting to be felt in produce marketing in Pacific island countries like Fiji and Samoa. The growers and traders in the PNG Highlands are only now starting to reap the benefits of the telecommunications revolution. However, this situation is expected to dramatically improve with the competition provided by Digicel Pacific's entry into the mobile telecommunications sector.

Overall assessment: Relatively poor but likely to improve considerably in the near future.

6.4.5 The financing environment for agribusiness

The commercial agriculture sector has been seriously constrained by the non-availability of affordable finance. There has been a dramatic decline in levels of financing for rural enterprises as a result of the traditional sources of financing being seriously weakened over the last decade. The commercial banks have largely withdrawn from rural lending, with the exception of the oil palm industry. This can be largely explained by the way the Government's large budget deficits have been financed. Until recently government expenditure has consistently exceeded revenues, often by substantial margins. These deficits could have been financed either by borrowing internationally or locally. PNG government opted for the latter option, selling Government Treasury Bills (TB) to the commercial banks. High foreign debt has been avoided by local funding of the budget deficit. However, with only a small local market available for funds, the selling of Treasury Bills drove up interest rates to exceptionally high levels. This made borrowing for investment in rural areas uneconomic. With the commercial banks being able to earn "super normal" profits by lending to government, there was no incentive to lend to productive sectors such as agriculture. In August 1999, the TB interest rate peaked at 28.0 percent per annum (Bank of Papua New Guinea, 2003). In 2004, for the first time in 13-years, a budget surplus was achieved. As a consequence, the TB interest rate fell below 5 percent making it worthwhile for banks to consider lending opportunities in productive sectors. The TB interest rate currently stands at around 4 percent (Bank of Papua New Guinea, 2007). However, there still remains reluctance from the commercial banks to lend to the agricultural sector unless these loans can be fully secured. Land usually cannot be offered as security and most agribusiness assets have low salvage value and thus are of limited value as security.

Overall assessment: somewhat poor but improving.

6.4.6 The policy environment

In recent years, the PNG government has produced two major long term policy documents on the agricultural sector that for the first time has made significant reference to an ornamental horticulture sector. These are: the White Paper on Agriculture (2005-2014: Toward National Food Security) and the National Agricultural Development Plan (2007 – 2016).

The White Paper on Agriculture

The White Paper identifies the potential of the cut flower and foliage segment in the chapter dealing with horticulture, where it is notes that:

Flowers, like many agro-forestry plants, provide fragrance use in pharmaceutical industry to produce essential oils, perfumes, cosmetics, and ornamental decorations. Flower oil marketing is commercially viable in other developing countries when supported with adequate processing and marketing facilities.

However, the White Paper is silent on how "adequate processing and marketing facilities" might be encouraged and developed.

Encouragingly a stronger case is made in the White Paper for the commercial development of the indigenous orchid segment, where it is stated:

Many orchid varieties found in the country are unique to PNG. Each habitat has its own orchid flora. Some species are widespread in areas with similar habitat; while others are confined to very restricted localities. Many orchids have considerable horticultural potential. Repeated sectional and intersectional crossing and backcrossing to generate newer types has almost limitless possibilities.

The White Paper's Policy Statement and Policy Objectives for Floriculture are listed below:

The Policy Statement for Floriculture:

- The Government shall promote floriculture to supply niche markets.

The Policy Objectives for Floriculture:

- To encourage more participation of individuals and farming communities in floriculture.
- To provide incentives to encourage private sector investment in the floriculture industry.
- To encourage post harvest technology development including preservation, processing and packaging of various flowers for local and overseas niche markets.
- To develop market access for export of native flowers.

The National Agricultural Development Plan

The Plan for the first time articulates strategies to develop a floriculture industry in PNG. These are listed under Horticultural Crop Development (objective 5) as:

- Assessment of opportunities, constraints and potentials of the various types of flowering plants for a floriculture industry in PNG. This will involve a nation-wide survey that was to be conducted in 2007. This study is yet to be undertaken despite an allocation of K700, 000 in the National Budget for this purpose.
- Promote floriculture and capacity building for women and youth in rural and peri-urban areas. This will involve four awareness trainings a year per region. K2.05 million is budgeted over 10 years, with K250,000 in 2007. Some of the 2007 allocation was used to support meetings of the PNG Floral Arts Society that was launched in September 2007.
- Identify funding sources for reviewing the floriculture industry in 2007.
- Increased production through establishing regional nurseries and distributing cuttings. The target is one nursery in each region with 30,000 cuttings distributed per year. K400,000 allocated per year over 10 years.
- Identify domestic and export markets for the cottage floriculture industry. K300,000 allocated per year over 10 years.

The National Agricultural Development Plan has a total notional financial allocation to floriculture development activities of K9.75 m., with K700, 000 included in the Ministry of Agriculture and Livestock's 2007 Budget.

Assessment of the policy environment

It is encouraging that for the first time, floriculture has been included in overall national policy and long term plans for the agricultural sector. Furthermore, there have been significant financial allocations to achieve the floriculture objectives outlined in the White Paper and Plan.

Absent from the White Paper and National Agricultural Plan is any reference to how agribusiness will be encouraged to invest in the ornamental horticulture sector. Such investment has been critical to the success of the East African floriculture export industries.

The strong recognition in the White Paper of the commercial potential of indigenous orchids provides a strong overarching policy framework under which the necessary specific policies to facilitate development of the sector can be put into place. This is now necessary as neither the White Paper nor the Plan make reference to the requirements for developing the indigenous orchid sector. The commercial development of this sector, which has considerable income generating potential, is currently stifled by the absence of such a policy.

Mr Kanawaii Pouru, Managing Director of the PNG Forest Authority, provided support for the need to formulate and enact an appropriate policy for the development of minor forest products, including orchids. Mr Bob Tate, CEO for Papua New Guinea Forest Industries Council[45], indicated that members of his Council would be interested in investing in sustainable commercial orchid development provided there was appropriate policy framework in place.

Overall assessment: An overarching policy framework to support ornamental horticulture development is now in place. Specific policies are now required to attract investment in various segments of the industry.

6.4.7 The institutional environment for floriculture development

Industry organisations

There are a number of groups and associations involved in PNG's floriculture industry. These are mainly fragmented grower groups as described above. A PNG Floral Arts Society (PNGFAS) has been recently formed, with support from MAL, to be the umbrella organisation for the PNG floriculture industry. The principal promoters of PNGFAS participated in the World Bank sponsored study tour of the Fiji floriculture industry in 2005. MAL sponsored an official launch in October 2007 and provided funding for a series of provincial workshops. In its present form, it is difficult to see how PNGFAS can be the driving force in industry development, the way the East African industry organisations, such as the Ethiopian Horticulture Producer-Exporters Association, have been. The PNGFAS has no legal basis upon which it can raise funds to finance its activities and does not involve commercial segments of the industry.

Overall assessment: fragmented and weak with respect to commercial industry development.

[45] *R. (Bob) Tate PO Box 229 Waigani N.C.D. tel 675 3259458; email fiapng@datec.net.png.*

Research, extension and training organisations

PNG has the longest standing and most comprehensive research system within the Pacific islands. Lowland and highland national agricultural research stations have been established in PNG since the 1920's. In order to cater to the diverse agro-ecological environments and the associated agricultural systems, research stations were opened in a wide range of sites including Central, Morobe, and Western provinces. Prior to 1980, the then Department of Primary Industry, now the Ministry of Agriculture and Livestock carried out most of the agriculture research. In the early eighties, the National Agricultural Research System (NARS) was reorganised and commodity-specific research institutions were formed. The National Agriculture Research Institute (NARI) was established in 1996 for research into food crops, alternative cash crops, spices, essential oils and livestock. NARI currently has no specific research activities specifically devoted to ornamental horticulture. However, NARI's recent senior appointment in post harvest handling has considerable experience in post harvest handling of ornamentals in the Philippines. She has expressed considerable interest in undertaking similar research with PNG's floriculture products. It is encouraging to note that NARI Conference Centre was provided as the venue for the Lae stakeholder meeting for this scoping study. The wives of NARI staff are amongst the most active in floriculture development in the Morobe Province.

In the recent past, National Capital Botanical Gardens in Port Moresby has been involved with research activities in collaboration with the National Herbarium of the Netherlands. This research has involved the eminent orchidologists Ed de Vogel and Art Vogel. As a result of this work, the understanding and knowledge of PNG orchids has been greatly enhanced. This work is likely to show that the total number of orchid species endemic to PNG will exceed the so far assumed number of some 3,000 species. These research activities are supported by the NCBG's tissue culture facilities, which remain operational despite severe financial constraints.

Under the provincial government reform, the provincial agriculture extension function was decentralised to the provinces. Ornamental horticulture is not included in programs of the provincial extension services. Overall, the Provincial extension is regarded as ineffective and has not delivered the anticipated results in promoting the growth of agriculture based industries and active participation of provincial farmers in agriculture development (National Agriculture Development Plan 2007-2016, p. 8).

Ornamental horticulture has been included in the portfolio of the ADB funded Small Holder Support Services Pilot Project (SSSPP) in the Eastern Highlands. Support has been provided to Exotic Blooms to provide extension and training to three village groups who ship flowers and foliage to Port Moresby. The Project manager has expressed interest in extending these arrangements to other locations.

There are no courses in ornamental horticulture offered by PNG's education and training institutions. In the past NCBG offered a wide range of ornamental horticulture courses, which included: basic orchid culture; advanced orchid culture; growing orchids for profit; improve your home garden; and garden plant care and propagation. Despite their popularity, these courses are no longer offered due to budget cuts and the changing management priorities.

Overall assessment: very weak

6.4.8 Regulatory bodies

Quarantine

The national quarantine functions are managed by the National Agriculture Quarantine and Inspection Authority (NAQIA), a statutory authority established by an act of Parliament in 1997. NAQIA has a dual mandated responsibility under the Act to:

- Preserve and protect the animals, plants and fish from exotic pests, diseases and weeds in the interest of national, social and economic development.
- Facilitate international trade through export and import risk analysis, and quality assurance systems thereby contributing to the Government's objective of export driven economic recovery policy.

Growing international trade, greater mobility and climate change make PNG's boarders increasingly more vulnerable to new pests and diseases. Many of these have the potential to seriously damage natural resources, threaten the economy and endanger food security.

Although PNG is currently relatively free of the major pest and diseases, it faces major challenges to the sustainability of its agriculture and resource base. The most recent out break of the late potato blight in the highlands and cocoa pod borer in Keravat, East New Britain province and Aitape in Sandaum province are classic cases of how pests and diseases can affect the socio-economic activities in a given area.
NAQIA provided the phytosanitary certificates for Exotic Blooms foliage shipments to Melbourne and provided advice on the quarantine treatment requirements for Australia. There are surprisingly no restrictions placed on importation of orchids into PNG. Potted hybrids orchids are regularly imported for international orchid shows. NAQIA has a critical role to play in facilitating the importation of improved planting material which is needed for the commercial development of the temperate and exotic tropical flower segments. A special focus on meeting this requirement is needed.

The cost of efficiently maintaining an effective quarantine and inspection service in such a large and dispersed country is very high. NAQIA is required to service the nine international ports of entry to minimise bio-security threats and assist in facilitating trade activities. However, according to the National Agriculture Development Plan 2007-2016, the funding for NAQIA has been inadequate to meet these requirements (p. 51).

Overall assessment: The inadequate funding and resources of NAQIA poses long term threats to the ornamental horticulture industry.

CITES and it administration

All PNG orchids are covered by Appendix 2 of CITES and their trade is regulated by a 2003 Act of the PNG Parliament. CITES is administered by the CITES Management Authority in the Department of the Environment. The export of orchids requires the verification of adherence to strict rules on how material is sourced from the wild and propagated. Under current regulations orchid propagation must originate from collected seed and not from cuttings. This poses a major constraint in terms of the infrequency of flowering and the long lead time propagating from seed. Also under the current interpretation of the PNG CITES Act, export certificates are not issued for primary (F1) hybrids. Thus potential exports are restricted to F2 hybrids. The inadequacy of these regulations for commercial development of the indigenous orchid industry is the lack of an appropriate policy for dealing with the development of minor forest products.

The enforcement of CITES is the responsibility of the Ministry of Environment's Wildlife Enforcement Department. The Department has a staff of three covering the whole country and has no detection equipment at the international ports. Thus the detection rate on

orchids being smuggled from PNG is extremely low – reported to be less than 1 percent by the Manager of Enforcement.

Overall assessment: There is policy in place to allow for the administration of CITES that would allow for the sustainable development of the indigenous orchid industry. Inadequate resources are devoted to the border enforcement of CITES thus there is a high rate of indigenous orchid smuggling.

6.5 Overall assessment of PNG comparative advantage in ornamental floriculture

6.5.1 Cut flowers and foliage

PNG offers some outstanding agro-ecological conditions for cut flowers and foliage and some niche market opportunities have been identified. However, in terms of overall export market development these are more than offset by intractable marketing and other constraints.

The table below provides a summary comparison for PNG and East Africa for the various factors that impact an exporting country's competitiveness:

Table 7: Comparison of PNG and East African floriculture exporters

Competitive factors	East African floriculture exporters	PNG
agro-ecological conditions	Outstanding in parts of the highlands	Outstanding in parts of the highlands
infrastructure (roads, power, telecommunications and water supply)	Generally good in areas best suited to floriculture production	Poor in most areas suited to floriculture production
frequent and reliable airfreight capacity	A feature of the East African industries	Adjudged the most critical limiting factor in PNG
proximity to global markets	Close direct access to Europe, the largest market. Direct access to North American and emerging Middle East market	Reasonable proximity to Asian markets – but severely constrained by direct air links.
wage rates in a labour intensive industry	Low particularly in Ethiopia and Tanzania	Relatively high compared with most East African producers.
ornamental skill levels	Reasonable as a result of training provided by a number of institutions in most countries.	Low given no training provided.
Government support for the industry	Strong government support for the industry, reflected in the attractive incentives in place particularly for foreign investors.	Recent government announcements support the development of the industry although concrete incentives not in place.
Access to land on long term basis.	Land made available to horticulture investors on long term basis	Long term access to customary land a major constraint to agribusiness investment in PNG. Innovative solutions have been developed in the palm oil industry that could be applied to ornamental horticulture
Donor support for sector	Characterised by high level of donor support, particularly directed at the private sector	Minimal donor support to date – anticipated that this will change as a result of this scoping study.

Overall conclusion: It is highly unlikely that PNG would be able to establish a cut flower export industry comparable to the industries of East Africa and Central America. However, a much more modest cut flower industry could be developed built around a significant expansion of the domestic market with some niche export of specialty products such as leaves.

6.5.2 Indigenous orchids

PNG offers some outstanding agro-ecological conditions to produce hybrid orchid plants for which there is strong export demand from markets in reasonably close proximity. These plants are less perishable than cut flowers and foliage. Thus the intractable marketing constraints identified for cut flowers have less of an impact on the competitiveness of these products. However, the development of this industry will depend on the resolution of institutional and legal constraints associated with CITES.

Overall conclusion: PNG has the potential to establish a major commercial indigenous orchid industry built around exporting hybrid plants and expanding eco-tourism activities provided regulatory and policy issues pertaining to CITES are overcome.

6.6 Requirements to realise opportunities

6.6.1 Cut flowers and foliage

A five fold increase in PNG's domestic market for floriculture products is seen as a realistic prospect if the identified constraints can be ameliorated. The inadequacy of physical marketing infrastructure (roads, telecommunications, airfreight capacity etc.) was identified as a major constraint. Poor physical infrastructure impinges on agricultural development generally but particularly constrains horticultural development due to the perishability of the products sold. The development of all PNG's horticulture industries depends on adequate public investment being made in physical infrastructure, particularly transportation infrastructure.

Working within the limits imposed by the existing infrastructure, there are measures that can be taken to expand the cut flower and foliage segment of the industry. Such measures lie in areas of training, skill upgrading and institutional development.

Training and skill upgrading

There is a need to develop basic skill levels in the growing, handling and arranging of floriculture products. This particular need was identified as a priority by participants' at all three stakeholder consultations. A useful first step would be to re-establish a revised set of courses offered by the Port Moresby National Botanical Gardens. A similar curriculum could be developed as part of the proposed redevelopment of the Lae Botanical Gardens.

The University of the South Pacific as part of its adult education outreach program has over the years operated a very successful floral arts course in member countries. Most of the 30 odd small florists in Fiji obtained their initial training through this program. It is these viable micro enterprises, who have the required high level of artistic skills that drive the rapidly growing demand for cut flowers in the domestic market. A high rate of return can be expected from such training. It is recommended a similar program be included in the adult education programs of PNG's tertiary education institutions. These floral art training courses could be developed and delivered in collaboration with PNG Floral Arts Society and would be a very worthwhile use of the National Budget allocation to MAL to support the development of floriculture. Technical assistance in curriculum development will be necessary.

South Sea Orchids in Fiji developed basic training materials to support their training programs for out grower suppliers. These materials included simple illustrative manuals on growing and handling orchids, anthuriums gingers and heliconias supported by posters. SSO has also published a simple manual: “Floriculture in Fiji as a Small and Micro Business”. This material is used as the basis for workshops across Fiji to assist in the development of viable floriculture businesses. Financial support for the development of this training material has been provided by the EU’s CTA. These training materials have contributed significantly to the competency levels of micro enterprises participating in the Fiji floriculture industry. The SSO/CTA Fiji training materials generated a considerable amount of interest amongst participants at the PNG stakeholder workshop for this scoping study. The Mount Hagen meeting passed a resolution that a similar set of training material be produced for the PNG Highlands and a request be put to CTA for financial and technical assistance. There was particular interest in the development of a manual for tuber roses. The preparation of training materials would also be an appropriate project to be undertaken under the auspicious of the PNG Floral Arts Society. There would be good scope for intra regional cooperation through SSO in the preparation of appropriate training materials.

CTA is planning a regional study tour to Fiji in collaboration with SPC and SSO. This will enable participants from the region to observe first hand SSO’s production and marketing arrangements and business operations. Leaders from the various active PNG floriculture groups would benefit greatly from participating in this study tour. It is expected that two or three participants from each regional country would be funded by CTA. Given the number of active floriculture groups operating in PNG it would worthwhile for MAL to fund some additional participants to take advantage of this once off opportunity.

Trained professionals are needed to provide the required training and supervision to develop an ornamental horticulture industry. As a first step, ornamental horticulture needs to be included in the curriculum of the relevant tertiary institutes such as the Vudal Agricultural University in East New Britain. This should include landscaping and nursery trades. It is recommended that technical assistance be provided in curriculum development. The industry also needs at least two or three people to be trained in floriculture from an appropriate overseas institution, such as Charles Darwin University in Darwin, Australia or the TAFE institute of North Queensland or the University of Hawaii College of Tropical Agriculture and Human Resources.

6.6.2 Institutional development

Facilitating the development of wholesale markets for floriculture products

For the foreseeable future, the main opportunities for the development a PNG cut flower industry lie in expanding the domestic market. However, growth in domestic demand for floriculture products has been seriously constrained by the absence of a wholesale market, erratic supply, and the high prices that prevail. This was the situation in Fiji a decade ago prior to the establishment of SSO’s wholesale markets. With the establishment of the wholesale markets, Fiji’s small growers have been able to concentrate their energies on producing quality cut flowers without concern as to whether there would be buyers for the flowers when ready to harvest. On the other hand, the florists were now aggressively promoting their products assured that a dependable supply base at a reasonable price is in place. The result was a significant expansion in the market for these flowers. The core local market for cut flowers is based on unpredictable highs and lows related to special life cycle events – deaths, births and marriages. However, florists with the development of the wholesale market have been able to secure contracts with local businesses and churches to supply arrangements on a weekly basis to overcome these fluctuations in business.

The PNG floriculture industry could benefit from technical assistance in the establishment of wholesale marketing arrangements. This would include the establishment of small markets in the main provincial centers. PNG participation in the CTA/SPC/SSO study tour to Fiji would be a useful starting point by providing exposure to a successful Pacific islands marketing system. However, the study must be followed up soon after by a specific technical assistance project to the PNG industry. This TA will advise on marketing arrangements that will allow for expansion of the domestic market. Part of the terms of reference would be to provide advice on developing cut flower and pot plant sales within municipal food markets.

Industry organization development

Both the Fiji and PNG scoping studies identified the need for an industry organisation that provided sound industry leadership in the areas of policy formulation, dealing with government and other agencies, education and information, setting standards, and promotion. To be successful, such an organisation needs to be small (low overheads), commercially orientated and sustainable. It is recommended that technical assistance be provided to assess the feasibility and requirements for the PNG Floral Arts Society becoming such a body.

6.6.3 Participation in the ginger and heliconia variety survey

After visits to Hawaii and Australia as part of this scoping study, it became apparent that the ginger and Heliconia segments in both Fiji and PNG were operating with a rather limited pool of available varieties. The markets in Australia and Hawaii rely upon the new and exciting flower types to keep customers interested in tropical flowers. On closer investigation and stakeholder interviews, we learned that there were actually more varieties in the case study countries than were available to florists and flower arrangers or the public at the market selling points. Many of these rare varieties were with collectors or in overgrown backyards.

It is therefore proposed to conduct a ginger and Heliconia variety survey in the Pacific with as many countries participating as possible. Plants will be surveyed, identified, photographed, and assessed for stem length, time of flowering and vase life. With this information in hand individual countries can work to commercially develop some of the varieties that have good potential. With a larger regional database there is the possibility for breeding programs and germplasm exchange.

6.6.4 Information on new varieties and sources of seed

For PNG to be able to successfully expand its temperate cut flower and exotic tropical flower segments industry, the industry needs access to the best possible planting material. For temperate cut flowers such as roses, there has been rapid technological change in terms of new varieties suitable to high land tropical conditions. It can be expected that the varieties that are available are likely to be far superior to what is currently present in PNG. For many tropicals, there are extensive breeding programs going on all over the world producing unique and superior varieties. The NT DPI has carried out breeding programs on heliconias and curcumas at their Bermiah farm in Darwin, Australia.

The PNG industry needs basic information on what planting material is available, its desirability in terms of the market and suitability to PNG conditions. Any technical assistance in this area would have to work in close collaboration with the farm supply companies and NAQIA. It is the farm supply companies that will source and import the seed and then promote and support its distribution. PNG has an advantage, compared with other PICs, of having well developed farm supply companies. NAQIA will need to be able to develop import protocols that maintain quarantine security but allow for the efficient and timely importation of floriculture planting material.

6.6.5 Indigenous orchids

It is the indigenous orchid segment of the ornamental horticulture industry that has been identified as having the greatest potential for development as a substantial rural income generating industry. Furthermore, the inadequacy of physical marketing infrastructure poses less of a binding constraint on commercial development of this sector. With the main constraints to development of the indigenous orchid sector lying in the area of policy, it is possible to have a major impact without large investments of public funds.

A policy for the sustainable commercial development of minor forest products

As discussed above, the application and administration of CITES in PNG has precluded investment in the sustainable commercial development of the indigenous orchid industry. As a result of this lack of investment, rural people have forgone substantial income opportunities and this unique resource has been depleted through lack of conservation incentives and illegal smuggling activity. To overcome this problem, PNG needs to develop an appropriate policy for the conservation and commercial management of indigenous orchids and other minor forest products. Providing technical assistance in the development of this policy is a major recommendation arising from this PNG Scoping Study.

A collaborative regional exchange program under the auspices of SPC

The Fiji Scoping Study identified the opportunity of a collaborative indigenous orchid exchange program between PNG, the Solomon Islands and Fiji under the provisions of CITES. The Fiji study noted that the Fiji indigenous orchid *Dendrobium tokai* was crossed with *D. phalaenopsis* (Cook Town Orchid) from Queensland Australia to develop the first University of Hawaii orchid hybrid. Marika Tuiwawa, Curator of the University of the South Pacific Regional Herbarium, identified the potential as follows:

There is great potential for utilising some of the Pacific plant species in breeding programs to develop a hybrid product that is completely unique to the Pacific. Genetic material can be gathered from various Pacific countries and brought to one place under the umbrella of an organization like SPC for the purpose of crossing these varieties to get a completely unique plant species (in particular, orchid species). This hybrid species can then be distributed back to the Pacific Islands (most likely the floriculture circles) for mass propagation and distribution (export or otherwise) and the opportunity for income generation. The potential revenues from a unique Pacific orchid species are enormous. Once the hybrid gets more than two generations away from its original wild type then it no longer comes under the CITES umbrella. The most obvious Pacific countries to collaborate on something like this are the Melanesian countries (Personal communication July 2007).

However, to achieve Tuiwawa's vision requires a coherent minor forest products policy in all three countries that encourages investment and sustainable commercial development has to be in place. Because of the opportunities for the Melanesian countries to collaborate in the development of their indigenous orchid industries, it recommended that any assistance in policy development cover all three countries.

Initial discussions have also been held with University of Queensland at Gatton Native Floriculture Department on the possible collaboration on such a breeding program. A more exhaustive scoping study on the feasibility of this project will need to be done and the most appropriate collaborative partners identified.

Investing in the National Botanical Gardens

The implementation of the National Botanical Gardens Development Plan was identified as a priority in the development of the PNG ornamental horticulture industry and in particular the indigenous orchid segment.

The experience of Singapore has shown that thriving Botanical Gardens is central to the development of an ornamental horticulture industry. Such a facility also has considerable tourism and recreation benefits.

It is envisaged that a revitalised NBG would play a central role in the artificial propagation and hybridisation of indigenous orchids for commercial development. Lae is seen as an ideal strategic location for such a facility, given that it has road links to a wide range of areas where primary material would be sourced and to where the village out growers of the hybrid plants would be located. It also has an international sea port for shipment to Asian markets.

The NFI in 2000 commissioned the preparation of a development plan for the Lae National Botanical Gardens. The Spivey Report (2000) outlines a five year K 872,006 investment program for the Lae Gardens, which covered scientific, educational and recreational components. No action was taken on the proposed Development Plan, although it was not clear if the Plan was accepted or rejected.

The redevelopment of the Lae Botanical Gardens needs to be revisited, taking the Spivey Report as a starting point. The required report should be in the form of a feasibility study that includes a thorough cost-benefit analysis. The cost-benefit analysis is needed to demonstrate to decision makers, both in government and private sector, the substantial returns that can be obtained from such an investment. It is suggested that expertise from the Singapore Botanical Gardens should be utilised in the carrying out this feasibility study. A suitable public private sector partnership will be necessary for this redevelopment to be successful and sustainable. The Papua New Guinea Forest Industries Council could be a potential private sector partner in the redevelopment, if it included a substantial commercial indigenous orchid component. It would be expected that this feasibility study would be used as a basis to attract private investment in the venture.

6.7 Recommendations for ACIAR/SPC involvement with the PNG ornamental horticulture industry

This scoping study makes a number of recommendations on actions to facilitate the development of the PNG ornamental horticulture industry. In a number of areas there is potential for ACIAR/SPC involvement. The identified areas are listed below along with collaborating partners.

- Policy development for minor forest product development (ACIAR with the PNG Forest Authority, CITES Management Authority).
- The development of framework for indigenous orchid hybridisation for Melanesian countries that is compliant with CITES and facilities the exchange and commercial development of indigenous orchids (ACIAR/SPC with USP Herbarium, National Herbarium Netherlands, Leiden, University of Queensland at Gatton, country CITES Management Authorities).
- Adult education programs for ornamental horticulture and floral art (SPC, USP, UPNG, UNITECH (University of Lae), PNG Floral Arts Society, CTA (EU), SSO (Fiji))
- Technical support for national tertiary institutions in the development of ornamental horticulture skills (ACIAR/SPC, Charles Darwin University, TAFE institute of N. Queensland, Vudal University).
- Survey and evaluation of gingers and heliconias in PNG and Fiji (SPC, PNG Floral Arts Society, SSO (Fiji)).
- Technical advice on the establishment of wholesale marketing system in PNG (ACIAR, PNG Floral Arts Society, SSO).

- Feasibility study and a plan for the re-development of the Lae National Botanical Gardens (AusAID/ACIAR, National Forest Institute, Singapore Botanical Gardens).
- Providing information on new varieties and sources of seed (ACIAR, DPI (NT), PNG farm supply businesses, NAQIA, PNG Floral Arts Society).
- Industry organization development (ACIAR, MAL (PNG), DPI (NT), PNG Floral Arts Society).

7 Conclusions and recommendations

7.1 The global context for PIC ornamental horticulture

Globally, horticulture has become a lead sector for poverty reduction in developing countries. Ornamental horticulture, in particular has driven growth in East Africa and Central America. This, however, has not been the case for the PICs. Floriculture product exports from the region are miniscule – with a significant floriculture trade deficit existing. This situation is surprising given the good agro-ecological conditions identified and apparent demand in Pacific Rim markets. The poor floriculture trade performance of the PICs contrasts markedly to that observed for the comparable regions of East Africa, Central America and the Caribbean.

7.1.1 World production and trade

The value of world production of floriculture products is estimated at around USD145 billion. Around 10 percent of this production enters international trade, with a projected growth of 3.5 percent annually through to 2012. Europe and the United States are the main markets. By far the leading exporter of floriculture products is the Netherlands, followed Colombia, Taiwan and East African producers. Tropical products are estimated to make up 4-5 percent of the total floriculture trade of which orchids and anthuriums make up 90 percent of this trade. Overall there is worldwide overproduction of tropical flowers. However, there are worthwhile niche markets available. Tropical foliage is a fast growing segment of the world floriculture industry and has been identified as one brighter spot for tropical ornamental products. The world trade in orchids exceeds USD 170 million annually. This trade is approximately divided between cut flowers (80 percent) and potted orchids (20 percent).

7.1.2 The emergence of East African producers

The value of Kenyan floriculture exports is now over USD200 million annually, with Ethiopia, Uganda and Tanzania all having significant industries. The emergence of East African producers as major exporters of floriculture products over the last few decades is of particular interest given that these industries are situated in tropical highland locations that are not agro-ecologically dissimilar to those found in the Highlands of PNG. A combination of factors has attracted substantial foreign investment into the East African floriculture sector, particularly from Dutch floriculture interests. These are listed as:

- outstanding agro-ecological conditions (PNG Highlands has equivalent conditions, poorer in other PICs)
- good infrastructure (roads, power, telecommunications, and water supply) in the most suitable production areas (Overall poorer in PICs - particularly in the PNG Highlands)
- substantial, frequent and reliable airfreight capacity (reasonable for Fiji, extremely poor for the PNG Highlands were it is the most critical limiting factor for floriculture development)
- proximity to global markets (PICs significantly disadvantaged with respect the largest markets of Europe and North America; PNG's reasonable proximity to Asian markets is offset by poor transportation links)
- low wages (wage rates significantly higher in most PICs)
- access to land on long term rental basis (land access a major constraint to foreign investors in horticulture in the PICs)

- high level of donor assistance to sector (support for the horticulture sector has not been a focus of donor support to the PICs)
- attractive government incentives (no particular incentive to agribusiness investors in the PICs).

7.1.3 Oceania trade in floriculture products

In 2006 exports from the Oceania region stood at USD 45 million and imports at USD 11 million. New Zealand is by far the largest exporter of floriculture products from region. Amongst the PICs only French Polynesia approach anywhere near significant exports of floriculture products, with the value of exports of the period 2002 to 2006 totalling around USD 330,000. Over the same period Fiji and the Cook Islands each exported around USD 60,000 of floriculture products. Australia is by far the region's largest importer of floriculture products, with imports over the period 2002-2006 totalling USD 26.4 million. Fiji, Cook Islands, PNG and Samoa all import floriculture products. While these volumes are small, they are significantly more than the value of floriculture products they export. Thus while the Oceania region taken as a whole has a substantial trade surplus in floriculture products, the PICs have a significant net trade deficit in floriculture products. The floriculture trade deficit for the Pacific islands contrasts markedly to that observed for the comparable regions of East Africa, Central America and the Caribbean.

7.2 PIC ornamental horticulture industries

This scoping study specifically covers Fiji and PNG. However, much of the findings are seen as relevant to the PIC region as a whole.

7.2.1 The Fiji industry

Overall the economic contribution of the Fiji floriculture industry is small. The annual contribution of the industry to GDP is estimated to be only around $1.4 million – measured in terms of value added. However, this is a highly labour intensive industry and generates the equivalent of one full time job equivalent for every $2,800 of value added that is created. Most of the participants are located on the main island of Viti Levu and concentrated around the main urban centers of Suva in the east and Nadi in the west. The vast majority of these participants are women.

South Sea Orchids (SSO), together with their contracted out growers (dendrobium orchids and anthuriums) and marketing outlets comprise the core of Fiji ornamental's horticulture industry. This group is made up of 82 growers, who have a combined total of 5 acres under shade. To this has to be added the over 100 heliconia and ginger growers who operate independently of SSO.

The growers

Dendrobium orchids sourced from the University of Hawaii (UH) are the most popular cut flower. There are 38 semi-commercial dendrobium orchid planting enterprises. At the nucleus of these growers is (SSO) with 70,000 flowering plants. Orchid sales through the SSO wholesale market system have increased steadily from around 7, 000 sprays in 2001 to peak at 14, 000 sprays in 2005, falling back to 10,000 sprays in 2006. The decline in the volume and value of sales in 2006 is attributed to some contracted growers selling outside the SSO wholesale system. Orchid growers who have followed the recommended package of practices have been able to earn worthwhile livelihoods.

Anthuriums sourced from Holland are the next most important cut flower. SSO now has 43 out growers of improved variety anthuriums. These growers command a total of around 60,000 flowering plants. In addition SSO currently has over 35,000 improved variety anthurium plants. Anthurium sales through the SSO wholesale have increased steadily

from around 20,000 stems in 2001 to stand at 63,626 stems in 2006. The small or micro anthurium enterprise offers similar grower returns to that obtained by orchid growers.

Gingers and heliconias are the most common flower sold in the local municipal markets, which is a growing segment. Over the years many new varieties have been introduced to Fiji – unfortunately often illegally smuggled into the country. The prices received for ginger and heliconia are significantly lower that that received for cut flower orchids and anthuriums and marketing risks are considerably higher. These negative considerations are offset to some extent by the higher yields obtained, the much lower capital cost of getting started and the much shorter lag between planting and production.

Several hundred small growers offer a wide range of potted plants and trees for sale. Many of these are women from villages and settlements. Plant sale events serve as the main point of sale for the potted plant growers.

Marketing

SSO established wholesale markets for orchids and anthuriums in Nadi and Suva in 2001. For the growers and end users, this development has meant that a degree of orderly marketing replaced a previously chaotic situation and has contributed significantly to an expansion of the local market.

There are 10 florists that are registered as businesses and operate out of shops. In addition there are now over 50 informal flower-arranging businesses operating out of homes. The growth in the small florist and flower arranging segment has been made possible by the creation of a wholesale market which provides a consistent supply of cut flowers, and by the availability of micro financing to commence operations. A notable feature of the florist/flower arranging segment of the industry over the last few years has been the entry of micro enterprises operated by indigenous Fijian women. These florists have high artistic skill levels, with many benefiting from various flower arranging courses provided over the years. With minimal overheads these micro enterprises can earn a worthwhile return on there skill and endeavours. The apparent profitability in small florist operations is reflected in their low attrition rate.

Trade in floriculture products

Floriculture exports from Fiji are small and declining. Exports have consisted primarily of heliconia cut flowers and cut foliage. Floriculture imports, in contrast to exports, are significant and have been increasing. Nearly 6,000 rose stems were imported in 2006 which represents a worthwhile import substitution opportunity. Only a 3 percent tariff is applied to the imports of floriculture products. In 2006 the International Centre for Trade and Sustainable Development undertook a Fiji case study of “Special Products and Special Safeguard Mechanisms”. It recommended that floriculture be nominated as a “Special Product” for tariff protection. This recommendation was based on the industries potential contribution to rural development and livelihood security. This scoping study concurs with this recommendation.

Indigenous orchids

Fiji has 164 species of indigenous orchids of which 51 are found only in Fiji. All these indigenous species are covered under CITES and cannot be shipped outside Fiji without a permit. It is suspected that smuggling does occur, although there have been no prosecutions made under the CITES regulation. Most of Fiji’s orchid species fall into the dendrobium family. Perhaps the most famous of the Fiji orchids is the *D. tokai* . This orchid is one of the parents of the first Hawaiian hybrid dendrobium orchid. None of Fiji’s indigenous orchids are grown commercially. CITES is important to preserving the biodiversity of Fiji’s ecosystems. CITES offers Melanesian countries, including Fiji, an outstanding income earning opportunity. However, the good intentions of the conventions

are being lost because stakeholders at all levels are ill-informed regarding its provisions and what they are intended to achieve. Growers and exporters often only see it is an unreasonable hindrance and expense to doing business with no obvious benefits in terms of the preservation of endangered species. The CITES authorities on the other hand, often do not have the technical expertise to properly assess proposed transactions and determine whether or not they should be subject to the CITES convention.

Research, extension and training

Formal ornamental horticulture research is nearly non-existent in Fiji. Floriculture is not included in the curriculum at Fiji College of Agriculture or the University of the South Pacific at Alafua, Samoa. On the quarantine side, a few applied research projects have been undertaken to facilitate exports. SPC has undertaken research on “red ginger decline” and recommendations are made in this study to continue this work. SSO conducts ongoing experimentation on suitable planting mediums for improved variety anthuriums. The Ministry of Agriculture doesn’t provide extension services for floriculture.

Training in floral art and ornamental horticulture was previously provided through SPC and USP. This training has been invaluable in developing the domestic demand for floriculture products.

The growing small-holder based floriculture industry has attracted a lot of interest, which has been fuelled by a considerable amount of media attention. Floriculture has been rightly perceived as an excellent way for households to generate income and employment. However, it is a demanding industry, where success requires considerable effort, skill and linkages to the market. Ill-informed new entrants without these essential ingredients face a high risk of failure. SSO’s recently published small holder manuals are a response to this problem and provides an excellent resource for existing and would be industry participants.

Quarantine

Quarantine related issues have been identified as major constraints to the development of the floriculture industry. Some phytosanitary and quarantine problems can be attributed in part to the performance of the Fiji Quarantine and Inspection Service (FQIS). An abundance of misinformation and lack of communication on the part of all industry stakeholders greatly compounds these difficulties.

The importation of live plants is crucial to the development of an emerging floriculture industry. Quarantine procedures for issuing import permits are often seen as unnecessarily rigid, inconsistent and often unreasonable. This in part explains the continued high incidence of plant smuggling, which puts the floriculture industry and other agriculture industries at risk.

A major boost towards resolving many of the quarantine related issues is provided by the *Survey of Agricultural Crops and Commodities Project, 2003*. The pest and disease survey covered orchids, anthuriums, gingers and heliconias. Fiji’s cut flowers face less quarantine restrictions than other horticultural exports. However, there are quarantine difficulties with cut flower exports. The prohibition of dendrobium orchid cut flowers into New Zealand is indicative of the problems faced with quarantine administration.

Industry organisations

A feature of the Fiji floriculture industry is the numerous support groups and associations. The most prominent of these are the SSO Floriculture Project and the Suva Orchid and Horticulture Circle. The SSO Floriculture Project provides a market outlet for some 70 out growers. The Suva Orchid and Horticulture Circle is a servicing group that has been in

existence since 1953. There are currently 300 active members. SOHC offers a range of classes in floral art which has facilitated an increase in demand for floriculture products.

The Fiji Floriculture Council`

A Fiji Floriculture Council (FFC) was established in1999 to prepare a strategic plan for the Fiji floriculture industry. The Plan has as its Vision: "the creation of a competitive world-class floriculture industry that contributes substantially to the prosperity of the people of Fiji" (1999). The FFC had 10 specific goals: 1) creating a "flower culture" within the tourism sector; 2) Fiji becoming a major exporter of floriculture products; 3) increasing income earning opportunities from floriculture; 4) enhancing skill levels and professional standards in the industry; 5) increasing the flow of information to the industry; 6) improving the quality of floriculture products sold on domestic and export markets; 7) improving quarantine arrangements for imports and exports; advising and coordinating new starters in the industry to minimize failures; achieving independence and increasing financial self reliance of the FFC; and, 10) securing technical and other assistance for the industry

The adoption of the FFC Strategic Plan coincided with the political turmoil of 2000. In this environment of political uncertainty and a depressed economy the FFC, was not able to effectively take root. However, the FFC is seen to provide an institutional framework that could be utilised to move the industry forward and there remains scope for the revitalisation of the FFC along the lines that was envisaged in the 2000 Strategic Plan for the industry. The Strategic Plan provides a framework for analysing the opportunities, constraints and requirements for the development of Fiji floriculture industry.

7.2.2 The PNG industry

Ornamental horticulture in PNG is a minor industry which is considerably smaller than that of Fiji. The PNG White Paper on Agriculture and the National Agriculture Development Plan have identified floriculture as having the potential to develop into a major industry. This potential is based on two distinct export opportunities:

- The export of temperate cut flowers and foliage.
- The export of products derived from PNG's unique indigenous orchids.

The growers

There are four cut flower grower groups operating out of the Eastern Highlands. These are:

- The Kerefa Women's Association (70 members growing a range of cut flowers and leaves and supply Exotic Blooms in Port Moresby on an intermitted basis)
- The Notofana Group (45 members growing tuberoses for Exotic Blooms)
- Gilaheka Group (80 members growing cordyline leaves used in trial shipment to Melbourne)
- Komiufa Growers Group (part of Komiufa integrated rural development project, which is involved in ongoing discussions with a Singaporean investor who is interested in a joint venture for rose development.

In the Mt. Hagen District, there are some 50 women who grow cut flowers for sale locally. These include a range of temperate flowers, cordyline leaves, indigenous orchids and some tropical such as heliconias. A similar number of flower growers were identified in the Morobe Province, including a ginger and heliconia grower who airfreights cut flowers to Port Moresby. The areas around Port Moresby are dry and harsh and not well suited to growing horticultural products. There is one small commercial grower of tropicals (gingers, heliconias and anthriums) situated 10 km outside Port Moresby. Tropical cut flowers and

orchids are also commercially grown at the Port Moresby National Botanical Gardens. Some Highland households in the settlements along the Sogari road grow ornamentals as a source of cash income.

Marketing

In Port Moresby, there is a small but growing floriculture marketing segment emerging. There are now 5 flower shops operating, which use both local and imported cut flowers. Two operate out of the largest supermarkets. There are no commercial florists operating in other urban centers.

There is no wholesale market for flowers operating in PNG. This marks a significant difference with Fiji, where the establishment of a wholesale market has been driving force in the development of the domestic market. The selling of flowers and plants in municipal markets is not feature in PNG, unlike the situation described for Fiji and that exists in Honiara and Port Vila. The absence of these markets poses a major barrier for micro enterprises wishing to enter the floriculture industry and is a major constraint to the development of the domestic floriculture market.

From time to time, there have attempts to export tropical cut flowers and foliage from PNG. The most ambitious effort was in 2003 when a test shipment of floriculture products (lilies, heliconia, gingers, celosias, orchid and cordylines) was made from Goroka in the Eastern Highlands to Aalmsmeer in Holland. This trial showed that it is technically feasible to ship cut flowers to Europe, although it is a risky and high-cost business. Despite the high expectations of the promoters and the favourable comments made about the quality of the leaves sent, there has been no follow-up interest in PNG as a supply source.

Exotic Blooms made a trial shipment of a selection of cordyline leaves to Melbourne in July 2006. The shipment was rejected by the Australian Quarantine. However, the exporter reports that these quarantine issues have been resolved and that they are ready to recommence shipments.

Indigenous orchids

A viable commercial orchid industry has yet to be established in PNG, despite the size a diversity of the resource and the substantial international demand that has been identified. There is now an opportunity to reverse this situation that is both commercially viable and environmentally sustainable.

PNG has more indigenous orchid species than any other country in the world. Overall, PNG accounts for around 10 percent of the some 30,000 known orchid species. The success of the *Orchidaceae* within New Guinea and its adjacent islands is the result of adaptation to diverse ecological conditions. Many of these orchids are horticulturally attractive and/or are of considerable botanical interest. As a consequence PNG orchids have been highly sort after and extensively exploited for over a century. Unfortunately, there has been little or no benefit to PNG's rural people.

All PNG orchids are covered by Appendix 2 of CITES. The export of wild collected plants is strictly prohibited. Under current regulations export of indigenous orchid plants is only permitted if they are second generation hybrids (F2) which were originally propagated from seed. These requirements preclude the viable commercial production of orchids due to the infrequency of flowering in wild and the long lead time required for propagating from seed.

Orchid conservation has been unsatisfactory in spite of efforts to enforce the ban on the removal of adult plants from the country. This valuable resource is being degraded due to loss of habitat and over-collection of certain species, driven by the illegal export of plants.

The only legal income currently generated by rural people from indigenous orchids is from small scale eco tourism activities and from plants sales to local collectors.

There are currently no commercial growers of indigenous orchids. In the past, there were commercial orchid nurseries operating in PNG. However, these are no longer viable under PNG's CITES regulations. The trading in indigenous orchids is largely limited to supplying the illegal export market.

The depletion of PNG's indigenous orchid resource and the absence of programs to develop a commercial industry based on resource conservation are reflected in the poor state of PNG Botanical Gardens, particularly in Lae. During the 1980s, the condition of the Gardens rapidly changed from a world class botanical reserve to a poorly maintained park in a state of disrepair and neglect. It is not appreciated by decision makers that a well managed and funded botanical garden has the potential to generate substantial economic social and environmental benefits and thus represent a good investment of public funds.

7.3 PIC comparative advantage and opportunities in ornamental horticulture

7.3.1 The Fiji industry

The FFC's ambitious Vision of the Fiji floriculture industry is based on a combination of factors: favourable climatic conditions; a relatively favourable pest and disease status; a nascent production and marketing structure already in place; a substantial under-supplied tourist based market; a strong non-tourist local market, a strategic location with respect to Pacific Rim markets; competitive labour costs compared with most other competing producing area; and, good air and air freight linkages. The Fiji Scoping study analyses each of these factors in turn to assess Fiji's comparative ornamental horticulture.

Fiji offers generally good climatic conditions for growing tropical flowers. However, unlike the Highlands of Papua New Guinea, Fiji does not offer any significant advantages in terms of climatic conditions for temperate floriculture products.

Fiji has a significant advantage in terms of its pest and disease status compared to many other producing areas. The future of the ornamental horticulture industry depends on the maintenance of this relatively favourable status. Fiji has been fortunate to maintain this status, despite the poor assessment of the performance of the industry and the quarantine service.

Based on the Hawaii experience, the tourism market for floriculture products in Fiji remains significantly under realised and provides the basis for a major industry. The key for Fiji developing a significant tourism based floriculture industry is for a "culture" to develop in the tourism sector that places priority in the use of high value flowers.

The non-tourist domestic market in Fiji remains undersupplied. A two to three fold increase in ornamental floriculture product consumption is a realistic prospect over the next few years if the supply of good quality products can be made available at reasonable (reduced) prices. Expansion beyond that level is probably not achievable without the substantial agribusiness investment that has characterised the floriculture expansion in South East Asia, East Africa, Central America and Hawaii. The challenge facing the existing Fiji floriculture industry and government policy makers is to be able attract foreign agribusiness investment into the industry without jeopardising the livelihoods of the participants of the existing industry.

Fiji's location does not afford any particular advantage on international floriculture markets. Overall Fiji's landed prices for cut flowers are too high and volumes too low to be competitive. There may be niche markets for speciality products such a certain types of leaves and off season orchids into Hawaii. These markets have yet to be proven.

Ornamental horticulture is a labour intensive activity, with wages rates and labour productivity will be key determinates of competitiveness. Fiji's floriculture industry has no particular comparative advantage in terms of labour costs and probably is at a distinct disadvantage when skill levels are factored into labour productivity.

Tourism creates a large domestic market for Fiji's floriculture products. The flights that bring the tourists also provide the outward freight capacity for the potential export markets for high value products such as floriculture products.

Fiji has good airfreight access to all Pacific Rim markets. This gives Fiji a major advantage when compared with other Pacific island exporters of floriculture and horticulture products. This advantage does not extend to competitors in South East Asia and Hawaii, particularly when freight rates are taken into consideration.

The overall conclusion is that Fiji's comparative advantage in ornamental horticulture firmly lies in supplying the domestic market. The industry is making good progress in realizing this comparative advantage to the non-tourist domestic market. The industry has been less successful with respect to the tourism segment. Nevertheless the comparative advantage with respect to the tourism market remains in tact. Niche export opportunities have been identified for speciality leaves and for indigenous orchids sold in compliance to CITES.

7.3.2 The PNG industry

The key determinants of PNG's comparative advantage in ornamental horticulture are: the agro-ecological environment; market opportunities; physical infrastructure; the financing environment for agribusiness; the policy environment and the institutional environment.

The agro-ecological environment

A suitable agro-ecological environment is a fundamentally necessary condition for establishing a substantial ornamental horticulture industry. There are sizable areas of PNG that meet this necessary requirement. The range of altitude, temperature and soil variability of the country has created an enormous ecological diversity. It is the highlands region of PNG that offers the best potential for horticulture and floriculture development. Parts of the highland region provide ideal conditions for growing temperate vegetables and flowers. At elevations of around 2,000 meters, the year round range of day time temperature is 22 to 30^{o}C and the night time temperature range is 6 to 12^{o}C. In most locations, at this elevation, there is considerable solar radiation. Rainy days are usually restricted to less than 100 days. These are almost identical conditions to those found in the highlands of East Africa, Ecuador and Colombia, which are amongst the world's leading floriculture regions.

The areas most suited to growing temperate horticulture crops are in the Western Highlands and Eastern Highland. This is due to a combination of ecological conditions, population pressure and accessibility. The New Guinea lowlands and islands offer excellent growing conditions for exotic tropicals. The areas around Port Moresby, which are best located in terms of proximity to transportation links, are poorly suited in terms of growing conditions.

Market opportunities for exotic tropical

Gingers and heliconias, from all sources, are excluded from the Australian market due to quarantine restrictions. There is small market available for gingers and heliconia in New Zealand. However, without direct flights this market cannot be contemplated.

A PNG exporter has indicated a readily available market of a tonne a week in Australia for exotic leaves from the Highlands. This view is not supported by market research by Pacific Islands Trade and Investment Commission which found very few importers even interested in dealing with the Pacific islands. This is primarily because the volumes were seen as too low and risk is perceived as too high compared with Asian suppliers.

Japan probably offers the best export market potential prospect for exotic tropicals from PNG. It is one of the world's largest flower importing countries – with niches available for high-quality exotic flowers. There is a direct flight Port Moresby to Narita, thus shipments would be feasible.

For the foreseeable future, it is the domestic market that offers the best demand prospects for tropical cut flowers and foliage. In PNG, local market demand is seriously constrained by the absence of a wholesale market, erratic supply, and high prevailing prices. The development of wholesale markets in PNG could be expected to have a similar positive impact on the demand for floriculture products.

The total potential market for tropical cut flowers and foliage is estimated at several million kina. This estimated is based on the Fiji experience - adjusted for the population, income level and income distribution. If temperate flowers such as roses were readily available at a reasonable price, a worthwhile domestic market could be expected amongst the growing urban middle class.

The market for indigenous orchids

The market for PNG indigenous orchids can be divided into two broad segments:

- "bringing the world to PNG orchids" (the eco-tourism market – which is not dependent of CITES compliance).
- "sending PNG orchids to the world" (the export market – which is dependent on CITES compliance).

The magnificent Papua New Guinea Orchids News website has created significant awareness for a potential global market. Some orchid eco-tourists belong to a small but dedicated group of enthusiasts who are specifically interested in orchids. However, for most tourists interested in PNG's natural environment, orchids represent another attraction along with birds of paradise, spectacular scenery and exotic cultures. There is significant scope for the expansion of eco-tourism in PNG, including tourism specifically related to orchids. This development will depend on more investment of the type proposed by Highlands Orchids (NHO) and more promotion of PNG's unique eco-tourism attractions. In the future, tourists and visitors might be able to purchase hybrid PNG orchid plants (with a CITES certificate) to carry back to their home countries as gifts and souvenirs of their PNG experience. Total non-resident visitor arrivals are estimated at only around 70, 000, compared with some 600,000 for Fiji. The overall development of orchid based eco-tourism faces the same constraints that limit the growth of tourism numbers to PNG generally. These include the poor market perception of PNG's law and order situation and air service and other infrastructure limitations.

A substantial export market has been identified in Asia for potted hybrid orchids. The best opportunities are for small plants with large flowers. Some would be sold to orchid collectors. However, it is expected that main market would be as upmarket household

beautification item for high income consumers who live in confined residential spaces. Exporters of indigenous orchids will not face the almost insurmountable supply chain constraints faced by cut flowers and foliage. Since potted orchids are relatively non perishable, a realistic option is to devise systems that assembled orchid plants at Lae for direct sea freight to Asian markets.

Any PNG hybrid orchid that is popular in the market is likely to be tissue cultured by competing business. Thus a sustainable marketing strategy for PNG hybrid orchids will involve two components:

- developing a certification program that would enable orchids to be sold as “genuine PNG sourced orchids”
- having a breeding program in place that allows for the ongoing pipeline of new PNG orchids ready for introduction into the market.

Physical infrastructure

Adequate physical infrastructure is also a basic necessary condition for the efficient marketing of perishable horticulture products. PNG, when compared with East African floriculture areas, falls well short of meeting this basic requirement.

For perishable cut flowers, transportation constraints more than offset any advantages PNG may have in terms of agro-ecological conditions. The establishment of the Highlands Highway in the mid-1960s opened up the prospect of PNG having a major commercial horticulture industry taking advantage of the excellent growing conditions. This potential is far from being realised due to inadequate maintenance, lack of supporting feeder roads and poor security. There are no direct road link to the main Highland production areas and the main urban center of Port Moresby and the international airport. Fresh produce therefore must be trans-shipped by air or sea.

Overall, domestic airfreight capacity is limited; freight rates are high and the quality of service less than satisfactory. International air freight capacity is also limited. There are currently daily flights from Port Moresby to Brisbane, weekly scheduled flights to Singapore and Narita, Japan. At present, Port Moresby is PNG’s only international airport.

A key element in the successful marketing of perishable products is the timely communication between growers, traders, buyers and transport providers. PNG growers and traders are only now starting to reap the benefits of the telecommunications revolution. This situation is expected to dramatically improve with competition now occurring in mobile telecommunications.

The policy environment

It is encouraging that for the first time, floriculture has been included in overall national policy and long term planning documents for the agricultural sector. Furthermore, there has been a significant financial, albeit notional, allocation to achieve the floriculture objectives outlined However, absent from these policy and plan documents is reference to how agribusiness will be encouraged to invest in ornamental horticulture sector. Such investment has been critical to the success of the East African floriculture export industries.

The strong recognition by the White Paper on Agriculture in the commercial potential of indigenous orchids provides a strong overarching policy framework, under which the necessary specific policies to facilitate investment and conservation in the sector can happen. As a result of the current lack of investment and conservation incentives, rural people are missing out on substantial income opportunities and a unique resource is being depleted.

The financing environment

The availability of rural finance in PNG is seen as a major constraint to investment in ornamental horticulture. Commercial banks and the Development Bank have largely withdrawn from rural lending. Land usually cannot be offered as security and most agribusiness assets have low salvage value and thus are of limited value as security.

The institutional environment

There are a number of groups and associations involved in PNG's floriculture industry. These are fragmented and weak, with respect to commercial industry development. Research, extension and training capacity in ornamental horticulture is also poor.

NAQIA has a critical role to play in facilitating the importation of the improved planting material needed for the commercial development of the temperate and exotic tropical flower segments. A special focus is needed on this requirement. The inadequate funding and resourcing of NAQIA poses long term threats to the ornamental horticulture industry.

There is no policy in place for the administration of CITES that allows the sustainable development of the indigenous orchid industry.

Overall assessment of PNG comparative advantage

PNG offers some outstanding agro-ecological conditions for cut flowers and foliage and some niche market opportunities have been identified. However, in terms of export market development these are more than offset by intractable marketing and other constraints. It is highly unlikely that PNG would be able to establish a cut flower export industry comparable to the industries of East Africa and Central America. However, a much more modest cut flower industry could be developed built around on a significant expansion of the domestic market with some niche export of specialty products such as leaves.

PNG has the potential to establish a major commercial indigenous orchid industry build around exporting unique hybrid plants and expanding eco-tourism activities, provided regulatory and policy issues pertaining to CITES are what?.

7.4 Requirements to realise opportunities

7.4.1 The Fiji industry

The Scoping Study identified as a realistic medium term vision for the Fiji industry "A competitive ornamental horticulture industry that makes a significant contribution to the livelihoods of a significant number of Fiji's households" An important first step in the realisation of this vision is the re-establishment of a Floriculture Council that is commercially orientated and sustainable. The Scoping Study identified the following facilitating goals for a revamped Council: 1) a "flower culture" within the tourism sector; 2) the consistent export of niche floriculture products; 3) increased earning opportunities; 4) enhanced skill levels and professional standards in the industry; 5) improved flow of information to industry stakeholders; 6) improved quality of products and services; 7) improved quarantine arrangements; 8) improved stakeholder understanding of CITES and the value of indigenous plants; and, 9) increased technical and other assistance to the industry.

The Council now needs to be reactivated with a Board elected under bi-laws that ensures representation of all segments of the industry with adequate representation of commercial drivers of the industry. A professional secretariat needs to be appointed to implement policies and to manage the day-to-day operations of the Council.

A "flower culture"

The Strategic Plan recommended that activities be directed at creating awareness of what the flower industry has to offer in terms of enhancing the quality of Fiji tourism product. This is now of greater priority given that ornamental horticulture becoming a major industry depends on expanding linkages with tourism and not on developing major export markets.

Consistent export of niche products

Providing up-to-date information on the quarantine requirements of importing countries is seen as a particularly important requirement. Additional recommendations that stem from the niche market export opportunities identified by this Scoping Study are (with the proposed collaborating institutions in parenthesis):

- Providing up-to-date information to the industry on CITES and how it impacts the export of orchid plants (*FFC, Environment Dept, USP Herbarium*).
- The development of an appropriate policy for non timber forest products that would facilitate the legal commercial development of Fiji's indigenous orchids (*FFC, ACIAR, SPC, Environ. Dept., MAFF*).
- The FFC needs to make ongoing representation to FQIS on market access issues (*FQIS, FFC, and NZ MAF*).

Increased income earning opportunities

Applied research could make a significant contribution to achieving the goal of increasing income earning opportunities from floriculture. "Red ginger decline" was identified in the Scoping Study as a problem warranting priority research attention.

Enhanced skill levels

The SSO out-grower project has shown that smallholders can successfully grow demanding cut flowers if the right training, supervision and direction are provided. However, overall skill levels at all levels are inadequate. To provide the required training and supervision for an expanded industry additional professionals are required. Ornamental horticulture needs to be included as a part of the Fiji College of Agriculture (FCA) curriculum as a first step. Landscaping and nursery trades, together with a floral art certificate course need to be included in the TPAF curriculum. At least 2 or 3 people need to be trained in floriculture from an appropriate overseas institution.

To enhance the skills and professional standards of the industry the FFC needs to:

- work with the USP, FCA and TPAF in the design of the floriculture/ornamental horticulture curriculum
- facilitate donor and technical support for the development of training materials for the industry
- coordinate workshops and short term industry training programs
- identifying appropriate overseas training for the industry.

Improved information flows

This Scoping Study has provided the foundation of a data base all participants in the industry. The maintenance of this database should be an ongoing activity for the Council. With a database established a regular industry newsletter could be prepared and distributed by the Council. The newsletter would contain regular features on production, marketing, quarantine, CITES etc.

Radio in Fiji remains the most important source of information. Thus it would be an appropriate activity for the Council to develop a regular “Fiji Flowers” radio feature. It was recommended that the Council establish a “Fiji Flowers” web-site to disseminate information about the Fiji floriculture industry to buyers and other interested parties. Over time, it was anticipated that the web site would be increasingly used to disseminate information to members of the Fiji industry.

More is required in providing realistic information about industry opportunities and the requirements for success. The Council has a role to play in bringing together potential growers and marketers and in providing an on-going service in small business training in floriculture and in the preparation of business plans for floriculture enterprises. This work should be undertaken in collaboration with the National Centre for Small and Medium Enterprise Development.

Improved quality

A positive approach to encouraging quality improvement should focus on two main areas:

- Obtaining, presenting and disseminating information on the quality requirements of various markets.
- Providing quality certification that will enhance marketability of those who achieve the standard.

It is recommended that a “Fiji Flowers” quality assurance and certification scheme be established. Those floriculture businesses that are able to meet the code of practices and quality standards established by the Council, would receive the “Fiji Flowers” seal of approval.

Improved quarantine arrangements

Quarantine significantly impinges on production and marketing of floriculture products. Major inconsistencies were also identified in quarantine requirements and procedures for the commercial importation of floriculture planting material. As the recognised representative of the industry, the FFC would be expected to play a key role in resolving these inconsistencies.

Fiji Quarantine has been agonisingly slow in negotiating quarantine “pathways” for fresh produce exports and having them approved by importing countries. A comprehensive review is needed, of Fiji’s quarantine regulations and procedures as they relate to floriculture. Technical assistance will be needed for such a review.

Niche export markets for various gingers, heliconias, and foliage products have been identified. There is very little understanding of what quarantine treatments are available and permissible and what is their cost and efficacy. There is a need for a collaborative applied research project that makes this information widely available to the industry in a form that is readily useable.

CITES and indigenous plants

The FFC is seen as the appropriate organisation to represent the interests of the industry in CITES related issues, and to provide information to the industry on the requirements of CITES and on the potential opportunities it creates. A CITES seminar would be an appropriate starting point for improving understanding of CITES as it relates to the ornamental horticulture industry.

The development of a gardeners guide to Fiji’s plants is recommended. The purpose is to bring about awareness of Fiji’s native ornamental plants and the role they can play in the garden/landscape. It is expected that such a publication will be a reference for students,

professionals, and gardeners/landscapers in other Pacific islands. It is proposed that such a project would be under the aucipies of the USP Regional Herbarium with support from SPC and ACIAR.

7.4.2 The PNG industry

A five fold increase in PNG's domestic market for floriculture products is seen as a realistic prospect, if the identified constraints can be ameliorated. The development of all PNG's horticulture industries depends on adequate public investment being made in physical infrastructure, particularly transportation infrastructure. Working within the limits imposed by the existing infrastructure there are measures that can be taken to expand the cut flower and foliage segment of the industry. Such measures lie in areas of training and skill upgrading, institutional development and policy development. The rehabilitation and upgrading of the Lae Botanical Gardens is also seen as central to the development of the PNG ornamental horticulture industry and in particular the indigenous orchid segment.

Training and skill upgrading

There is a need to develop basic skill levels in the growing, handling and arranging of floriculture products. A first step would be to re-establish the set of courses offered by the Port Moresby National Botanical Gardens. The Fiji experience has illustrated the value of providing adult education and outreach training programs in floral art. Leaders from active PNG floriculture groups would benefit greatly from participating in the proposed SPC/SSO/CTA/ study tour to Fiji in 2008. For the longer term trained professionals are needed to provide the required training and supervision for industry development. Horticulture and floriculture needs to be included in the curriculum of the relevant tertiary institutions. This should include landscaping and nursery trades. Technical assistance will be required in curriculum development. The industry also requires a minimum number of people trained in floriculture from appropriate overseas institutions.

Institutional development

The PNG floriculture industry could benefit from technical assistance in the establishment of wholesale marketing arrangements. This would include the establishment of small wholesale markets in the main provincial centers. PNG participation in the CTA/SPC/SSO study tour to Fiji would be a useful starting point by providing exposure to a successful Pacific islands marketing system.

Both the Fiji and PNG scoping studies identify the need for an industry organization that provided sound industry leadership in the areas of policy formulation, dealing with government and other agencies, education and information, setting standards, and promotion. To be successful such an organization needs to be small, commercially orientated and sustainable.

For temperate cut flowers such as roses there has rapid technological change in terms of new varieties suitable to high land tropical conditions. The PNG industry needs access to the best available material if it to compete. Information on what planting material is available and its market desirability and suitability to PNG conditions is required. Technical assistance in this area would have to work in close collaboration with the farm supply companies and NAQIA.

Policy development

It is the indigenous orchid segment of the ornamental horticulture that has been identified as having the greatest potential for developing to a substantial rural income generating industry. However, the application and administration CITES in PNG has precluded investment in the sustainable commercial development of the indigenous orchid industry. To overcome this problem PNG needs to develop an appropriate policy for the

conservation and commercial management of indigenous orchids and other minor forest products. Providing technical assistance is the development of this policy is major recommendation of this Study.

Lae Botanical Gardens

The redevelopment of the Lae Botanical Gardens is seen as a priority in the development for the ornamental horticulture and in particular the indigenous orchid industry. A feasibility study is required that involves a thorough benefit cost analysis to demonstrate to decision makers the returns from such an investment. It is expected that the feasibility study would be used as a basis to attach private investment in the venture.

Regional collaborative effort on the development of indigenous orchids

It is proposed to establish a breeding program which utilizes genetic materials from several Pacific island countries into one central location for the purpose of developing 'Pacific Plants' that can then be distributed back to the floriculture industries of the Pacific islands for mass propagation and resale. It is recommended that such a program be initiated under the auspices of SPC. The structure of such a project is complex as it involves multiple government departments; quarantine, forestry, plant protection, as well as international treaties such as CITES and plant variety rights (PVR). Thus a feasibility study is required to determine the viability of such a project, together with resource and implementation requirements. The feasibility study should also identify appropriate regional and international partners and donors. The feasibility study will require specialist expertise in plant breeding and the commercial aspects of orchid hybridization and marketing. Expertise will also be required in international trade policy and regulations relating to the movement of plant materials. Successful implementation will require the participating countries to coherent minor forest products policies that encourage investment and sustainable commercial development of orchid resources.

7.5 Recommendations for ACIAR/SPC involvement with the ornamental horticulture industries in the Pacific

7.5.1 The Fiji industry

The Fiji Scoping Study identified a number of potential activities for ACIAR/SPC in the development of the ornamental horticulture industry. These are listed as:

- Red ginger decline research (*identified collaborating partners: FFC, Research Div. MAFF, SPC, ACIAR, DPI NT (Aust.).* The Northern Territory Department of Primary Industries recently undertook a successful project on the nutrition of ornamental ginger. It is proposed that similar research work can be done with ornamental ginger in Fiji to combat the growing problem of red ginger decline.
- The development of a Gardeners Guide to Fiji's Native Plants (*identified collaborating partners: USP (Regional Herbarium), ACIAR, SPC*).
- The development of pilot "Fiji Flowers" quality assurance and certification scheme (*identified collaborating partners: FFC, ACIAR*). A market research based pilot project is seen as the appropriate first step to successfully establish a quality assurance program. ACIAR's new agribusiness research program might be a possible source of support for such a pilot project.
- A review of Fiji's quarantine regulations and procedures relating to floriculture (*identified collaborating partners: FFC, FQIS, SPC, ACIAR, AQIS*).
- The development of cost effective quarantine treatments for ornamental exports (*identified collaborating partners: FFC*, FQIS, MAFF Research, SPC, ACIAR, University of Hawaii, AQIS and NZ MAF).

7.5.2 The PNG industry

The Fiji Scoping Study identified a number of potential activities for ACIAR/SPC in the development of the ornamental horticulture industry. These are listed as:

- Policy development for minor forest product development (identified collaborating partners: ACIAR with the PNG Forest Authority, Papua New Guinea Forest Industries Council, CITES Management Authority).
- Adult education programs ornamental horticulture and floral art (identified collaborating partners: SPC, USP, UPNG, UNITECH (University of Lae), PNG Floral Arts Society, CTA (EU), SSO (Fiji).
- Technical support for national tertiary institutions in the development of ornamental horticulture skills (ACIAR/SPC, Charles Darwin University, TAFE institute of N. Queensland, Vudal University)
- Survey and evaluation of gingers and Heliconia varieties in PNG and Fiji (SPC, PNG Floral Arts Society, SSO (Fiji)).
- Technical advice on the establishment of wholesale marketing system in PNG (ACIAR, PNG Floral Arts Society, SSO)
- Feasibility study and a plan for the re-development of the Lae National Botanical Gardens (identified collaborating partners AusAID/ACIAR, National Forest Institute, Singapore Botanical Gardens).
- Providing information on new varieties and sources of seed (ACIAR, DPI (NT), PNG farm supply businesses, NAQIA, PNG Floral Arts Society)
- Industry organization development (ACIAR, MAL (PNG), DPI (NT), PNG Floral Arts Society).

7.5.3 Regional Collaborative Efforts

A number of the recommended activities for ACIAR and SPC are regional in nature. These are:

- The development of framework for indigenous orchid hybridization for Melanesian countries that is compliant with CITES and facilities the exchange and commercial development of indigenous orchids (ACIAR/SPC with USP Herbarium, National Herbarium Netherlands, Leiden, University of Queensland at Gatton, country CITES Management Authorities).
- The development of appropriate policy framework for the countries of Melanesia to deal the sustainable commercial development of minor (non-timber) forest products.
- Technical support for national and regional tertiary institutions in the development of ornamental horticulture skills.

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9 Appendixes

9.1 Fiji Pest and Diseases vs. Hawaii Pest and Diseases for selected floriculture products

Fiji	Hawaii
Orchids	**Orchids**
Dendrobium, Vanda,	***Dendrobium, Vanda,***
Cymbidium, Phalaenopsis	***Cymbidium, Phalaenopsis***
Insect scientific name	**Insect scientific name**
Aleurodicus disperus	*Cerataphis orchidearum*
Chelisoches morio	*Macrosiphum luteum*
Chrysomphalus aonidum	*Orchidophilus aterrimus*
Orchidophilus atterimus	*Orchidophilus peregrinator*
Pseudococcus dendrobium	*Xylosandrus compactus*
[Pseudococcidae]	*Nezara viridula*
Parlatoria proteus	*Chrysodeixis eriosoma*
Mirridae or Reduviidae	*Contarinia maculipennis*
Disease pathogen scientific name	*Pseudococcus dendrobiorum*
Glomerella cingulata	*Pseudococcus beardsleyi*
Phyllosticta capitalensis	**Misidentified as P. elisae*
Pseudocercospora sp.	*Pseudococcus longispinus*
Burkholderia cocovenenans	*Brevipapus phoenicis*
Pectobacterium cypripedii	*Diaspis boisduvalii*
Monographella cucumerina	*Furcaspis biformis*
Schizophyllum commune	*Pinnaspis aspidistrae*
Virus scientific name	*Pinnaspis buxi*
Cymbidium mosaic virus	*Vinsonia stellifera*
Odontoglossum ringspot virus	*Dichromothrips corbetti*
	Frankliniella occidentalis
	Frankliniella shultzei
	Haplothrips gowdeyi
	Helionothrips errans
	Heliothrips haemorrhoidalis
	Hercinothrips femoralis
	Thrips hawaiiensis
	Thrips palmi
	Thrips tabaci
	Eurytoma orchidearum
	Bemisia tabaci
	Disease pathogen scientific name
	Fusarium Primer
	Fusarium proliferatum
	Phyllosticta Primer

	Phyllosticta capitalensis
	Phytophthora infestans
	Phytophthora nicotianae
	Phytophthora nicotianae
	Virus scientific name
	Cymbidium Mosaic Virus
	Odontoglossum Ringspot Virus
	Tomato Spotted Wilt Virus
	Potyviruses

Fiji	**Hawaiii**
Anthuriums	**Anthuriums**
Insect scientific name	**Insect scientific name**
Coccus hesperidum	*Xylosandrus compactus*
Crenidorsum aroidephagus	*Elimaea punctifera*
Encyrtus sp.	*Nipaecoccus nipae*
Hemiberlesia palmae	*Brevipalpus phoenicis*
Icerya seychellarum	*Diaspis boisduvalii*
Microterys sp.	*Pinnaspis buxi*
Parasaissetia nigra	*Pulvinaria psidii*
Paratrechina vaga	*Vaginulus plebius*
Pheidole oceanica	*Veronicella leydigi*
Selenaspidus articulatus	*Chaetanaphothrips orchidii*
Disease pathogen scientific name	*Chaetanaphothrips signipennis*
Helicotylenchus australis	*Echinothrips americanus*
Helicotylenchus microcephalus	*Frankliniella occidentalis*
Meloidogyne sp.	*Aleurothrix antidesmae*
Radopholus semilis	*Aleurotulus anthuricola*
Rotylenchulus reniformis	*Crenidorsum sp.*
	Disease pathogen scientific name
	Aphelenchoides fragariae
	Calonectria sp.
	Colletotrichum Primer
	Colletotrichum gloeosporioides
	Dasheen mosaic virus
	Helicotylenchus erythrinae
	Pythium Primer
	Pythium splendens
	Radopholus similis
	Rhizoctonia Primer
	Rhizoctonia sp.
	Xanthomonas Primer
	Xanthomonas campestris pv. dieffenbachiae

Fiji	Hawaiii
Ornamental ginger	**Ornamental ginger**
Insect scientific name	**Insect scientific name**
Ceroplastes rubens	*Anoplolepis longipes*
Coccus hesperidum	*Monomorium floricola*
Dysmicoccus brevipes	*Paratrechina vaga*
Hemiberlesia palmae	*Solenopsis geminata*
Parasaissetia nigra	*Technomyrmex albipes*
Pentalonia nigronervosa	*Aphis gossypii*
Pinnaspis strachani	*Pentalonia nigronervosa*
Planococcus minor	*Chelisoches morio*
Pseudococcus orchidicola	*Sophonia rufofascia*
Pulvinaria urbicola	*Planococcus citri*
Tetramorium bicarinatum	*Pseudococcus virburni*
Disease pathogen scientific name	*Pseudococcus longispinus*
Meloidogyne sp.	*Coccus viridis*
Sphaeronema sp.	*Hemiberlesia rapax*
	Pulvinaria psidii
	Pinnaspis strachani
	Sciothrips cardamomi
	Disease pathogen scientific name
	Helicotylenchus sp.
	Marasmius
	Meloidogyne Primer
	Meloidogyne sp.
	Mycosphaerella Primer
	Mycosphaerella hedychii
	Phyllosticta Primer
	Phyllosticta zingiberis
	Pseudomonas Primer
	Pseudomonas solanacearum
	Pythium Primer
	Pythium sp.
	Radopholus similis
	Rhizoctonia Primer
	Rhizoctonia sp.
	Rotylenchulus reniformis

9.2 Summary report of the visit to Hawaii by Aileen Burness (March 2nd – March 9th 2007)

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Summary of activities and interviews

Day	Activity
Friday 2nd March	Arrive in Honolulu from Fiji
Friday 2nd March	Meeting with Ben Kodama (Orchid grower and nurseryman)
Friday 2nd March	Meeting with Dave Thompson (Mea Pacific Traders – Maile lei importer)
Saturday 3rd	Travel to Hilo
Saturday 3rd	Meeting with Andrew McGregor, visits to the cut flower markets
Sunday 4th March	Visits with McGregor to cut flower markets and retail flower outlets
Monday 5th March	Meeting with Calvin Ksewake and Andrew Kobata – University of Hawaii
Monday 5th March	Visit to University of Hawaii Anthurium Experimental Unit – Interview with Joana
Tuesday 6th March	Meeting with Mike Inouye (Pacific Floral exchange)
Tuesday 6th March	Meeting with Robert Stearns at (Lelani foliage)
Tuesday 6th March	Return for tour of Pacific Floral Exchange with Mike Inouye
Wednesday 7th March	Picked up plants purchased from Mike at Pacific Floral Exchange – final meeting
Wednesday 7th March	Return to Honolulu
Thursday 8th March	Meeting with Ken Leonard – University of Hawaii
Thursday 8th March	Meeting with Dave Thompson (Mea Pacific Traders – Maile lei importer)
Thursday 8th March	Meeting with Chevy Yara (Watanabe Floral Inc.)
Friday 9th March	Meeting with Maggie Lalatine (Marriot Hotel – Honolulu)
Friday 9th March	Return to Fiji

Review of activities and interviews

Ben Kodama (Orchid grower and nurseryman)

Business used to propagate orchids using tissue culture, now they have stopped and are importing from Thailand. Kodama reported that it is cheaper to buy tissue culture flasks from Thailand than to produce them in Hawaii. Kodama used to do cut flowers but now solely produces pot plant orchids. He imports flasks from Thailand, grows them out in pots and then ships them to either Japan or mainland USA - Florida, California etc. Hawaii

floriculture industry has a deal with Fed Ex to provide good freight rates and handling practices to distribute the products.

Important note: Shift from production of orchid cut flowers to orchid pot plants has opened a niche market for Fiji because there is less Dendrobium cut flower orchids in Hawaii. It was reported that many customers would rather buy University of Hawaii varieties of Dendrobium orchids that are Hawaiian grown because they last longer than those imported from South East Asia. It was reported that the orchids imported from South East Asia have nearly half of the buds unopened and these usually do not open.

Dave Thompson (Mea Pacific Traders – Maile lei importer)

Currently imports Maile leis weekly from the Cook Islands. Fiji was previously approached as another possible supplier however this never eventuated despite being investigated and found to be viable. Thompson reported that he was still interested in importing from here if there was someone who could supply consistent leaves. Thompson gave a formal letter of interest to Fiji producers for Maile leaves.
Thompson reports:

- It has worked out really well for the rural areas of Cook islands
- They received funding for refrigeration to hold the leaves
- Main imports are from the Cook Islands which he supplies to the floriculture market in Hawaii, mostly supplies florists through the main wholesale market Watanabe Floral Inc
- He could supply the mainland markets if he had enough leaves and a consistent supply.

Visit to Hilo farmers market

Numerous small anthurium and orchid growers sell their flowers at the Hilo market every Friday, Saturday and Sunday. A feature of the market quality of the flowers and there relatively low price of the flowers on offer compared with Fiji. Simple flowers arrangements utilizing used A10 cans as base were observed. This method could be utilized by our Fiji growers.

Calvin Ksewake and Andrew Kobata – University of Hawaii

Comparing the Fiji floriculture industry with the Hawaii industry it was reported that a lot of the things that happened in Fiji mimic the industry in Hawaii. The difference is that Hawaii was already very accustomed to buying flowers and had been trained in using flowers. Anthurium production has been widely encouraged by the University; they visit the growers and address constraints. Hawaii has a valuable planting medium in the volcanic cinder. Andrew looks after a lot of the foliage growers, helps to diversify their products. The Ministry of Agriculture works out what the best things to grow are and how exactly to do it, they also

develop new varieties that they breed and distribute to the growers. There are associations that are specific to products that help with market access.

Mike Inouye (Pacific Floral exchange - Hawaii Tropical Flower Council)

He is a large grower of orchids and anthuriums – he has a grower's scheme similar to SSO and lots of his growers were really playing up, he has had to modify his tactics to filter out the bad growers and focus on the really serious ones. Through his growers he brings in a lot of anthuriums, orchids, gingers, helconias, and leaves. He buys and then packs and ships to the mainland. His big job is to make sure that high quality products come in and then are handled properly before being shipped out. Most of these flowers go to the mainland. They use vasili, bamboo orchid leaves and a few anthuriums to create ready made bouquet products that can just be opened and then put on the shelves. Wholesale supplier to florists, retails markets etc. Tour of facility showed all of the grading and packing practices for export.

Robert Stearns (Lelani foliage – President off Hawaii Export Nursery Association)

Producer of various foliage types including vasili (cordyline), dracaena, they grow plants in 3 gallon pots in volcanic cinder and then shipped in the big pots to nurseries in the US. Pot plant foliage for offices, homes etc. Almost entire nursery is above ground in a semi-quarantine state. They are certified as quarantine post.

Ken Leonhardt – University of Hawaii

Regarding expansion of the Fiji floriculture industry; Guzmanias and bromeliads are recommended, proteas are also a possibility if there is a suitable growing area. Problem in Hawaii is that a lot of people don't want to work as gardeners. Nursery only pays $8 an hour. Roses have a lot of problems in our tropical climate and might be more trouble than they are worth. Vanda or oncidium orchids 'gal ramsey' will be a good expansion for the Fiji industry, providing a bigger range of flowers to be able to sell on the market. Tissue culture is going to be cheaper to import from Thailand. You have to import all the materials to do tissue culture so might as well just import the flowers or planting materials. Said he would collect foliage plants and send them down to Fiji. He thinks that the leather leaf fern (from Florida and Costa Rica) would be a good cut foliage product for domestic and export markets. But like the protea it needs to be grown in high altitudes. Ti leaves, or dracaena that we may not have here he could help bring it in as mother stock.

Chevy Yara (Watanabe Floral Inc.)

Watanabe is a very large wholesale and retail supplier of floriculture products in Hawaii. Yara is the assistant buyer and expressed interest in purchasing from Fiji growers. In particular there is an interest in Dendrobium orchids during Hawaii's winter months October to March which coincides with Fiji's peak production months. Preliminary discussions regarding price were positive. Factors still left to explore are freight space and cost. Yara also

reported that there is an opportunity for cut foliage and gingers and heliconias during this same winter period.

Maggie Lalatine (Marriot Hotel – Honolulu)

They have an in house florist that sources some materials from the wholesale market and some from a small nursery in the back of the hotel. The only thing that the hotel brings in is the leis which are for conferences and special groups. The in house florist makes the deals.

9.3 Survey of Tourist Industry Operators

Survey of tourist industry operators

FLORICULTURE PRODUCT PROCUREMENT

1. Where do you usually source your cut flowers, foliage and ornamental and landscape plants from?

Source	Product			
	Cut flowers	***Foliage***	***Potted plants***	***Landscape plants***
Hotel landscape				
Hotel nursery				
Local florists				
Flower wholesaler				
Local nursery				

Other source…….

2. On which basis do you decide how much CF/F/O/L to purchase?

☐ A fixed amount is purchased regularly,
☐ Amounts purchased change every week, depending on my needs
☐ Other
(Specify: ……..)

3. What are the approximate quantities of CF/F/O/L each month? (Estimate amounts per product and according to period of purchase-low or high season- if applicable)

Quantity purchased/week	Product			
	Cut flowers	***Foliage***	***Potted plants***	***Landscape plants***
Low season				
High season				
Irrespective of season				

4. How often do you buy CF/F/O/L?

Frequency of purchase	***Cut flowers***	***Foliage***	***Potted plants***	***Landscape plants***
Daily				
Twice or more times per week				
Once a week				
Once every .....days				
Other (Specify:…….....)				

5. What factors do you take into account when purchasing CF/F/O/L?
(Rank 1 to 4, with 1 as the most important criterion)

Factors of relevance	*Cut flowers*	*Foliage*	*Potted plants*	*Landscape plants*
Price				
Quality				
Availability of supply/consistency of supply				
Range of products available				
Size of supply for products available				
Other (Specify:……..)				

6. Please rank the most important criteria you use to assess potential suppliers of CF/F/O/L *(Rank 1 to 6, with 1 as the most important criterion)*

☐ The supplier has available a diversified range of products
☐ Quality of products supplied
☐ Reliability of the supplier in terms of continuity of his CF/F/O/L supply throughout the year
☐ Price of product
☐ Willingness of suppliers to deliver to my premises
☐ Other (Explain: .....)

7. What delivery requirements do you enforce at your enterprise*? (More ticks allowed)*

☐ All products should be delivered at my premises
☐ All products should be delivered before a given time during the day
☐ Deliveries can be made by a courier service
☐ Other (Specify:……...)

8. How much in advance do you tell your suppliers about the quantity of CF/F/O/L you need to buy?

Terms of notification	*Cut flowers*	*Foliage*	*Potted plants*	*Landscape plants*
One week or more				
2-3 days				
The day before				
Other (Specify:……..)				

9. How do you usually pay your suppliers of horticultural/floriculture products?

☐ Advance payment (Specify percent: ……..)
☐ Cash payment
☐ 15-30 days credit
☐ 30-90 days credit

10. Do you have an in-house florist?

11. When you have weddings who does your flowers/bouquets?

12. When you have conventions who does the flowers?

13. What factors would need to change in order for your to start buying more of your floriculture products from outside sources?

OTHER INFORMATION

Please fill in details below:

Hotel Name: ……
Number of stars: ……
Total number of rooms: ……
Address: ……
Tel. & Fax No : ……
Name & charge of person interviewed: ……

Name of surveyor: ……..……	Place of the interview: ……
Date of interview: ……..……	Progressive number of interview: ……

9.4 ACIAR/SPC Ornamental Horticulture Scoping Study: PNG Trip Report

Prepared by Andrew McGregor, August 2007

9.4.1 Summary itinerary

- July 18th – 19th Lae
- July 20th – 21st Port Moresby
- July 23rd – 24th Programmed for Goroka and Eastern Highlands (cancelled due non operation of Air Niugini)
- July 25th – 26th Mt Hagen and Western Highlands
- 27th – 28th Port Moresby

Lae (July 18th – 19th)

Stakeholder Meeting

A stakeholder meeting was held at the Lae NARI Conference Center on the morning of July 18th . The Ornamental Horticulture meeting was combined with the Annual Conference of the Women in Agriculture NGO. There were 51 participants at the Ornamental Horticulture meeting. They were from the following locations: Markham; Bubia (Lae); Butibam (Lae); East Sepic; Enga; and Western Highlands

A list of the participants is presented in annex 1. Various participants provided an impressive set of flower arrangements – these were of the highest standard of the flower arrangement provided for the 3 meeting held during the field trip. These floral arrangements were initially provided for the ANU Crawford School Workshop of Pacific Islands Agriculture that was held the previous day.

The Women in Agriculture Conference was opened by ACIAR PNG Director Dr Jacqui Wright. Andrew McGregor then made a presentation on Floriculture in the Pacific Islands and outlined the Scoping Study. The following power point was presented.

What is scoping study looking at

- Opportunities
- Performance
- Constraints
- Recommendations to overcome Constraints
- Identifying activities for ACIAR

Countries covered

The world scene

- World production in floriculture products USD 80 billion – 10% exported
- Leading exporter is the Netherlands, followed by two South American producers Colombia and Ecuador.
- East African countries are the leading emerging suppliers.

African nations suppliers to the EU
Kenya-**$200** million
One grower ships **1.5** million roses daily
Uganda-**$36** million
500,00 roses for Valentine's Day

Project a **3.5%** annual increase to **2012**

Why the success?

Tropical Floral Production

- Tropical products **4%** to **5%** of total trade
  $400 to **$500** million
- **Orchids** and **Anthuriums 90%** of tropicals traded

Conflicting story on demand for tropical floriculture products

- UH study identifies good growth for tropical floriculture products in travel and tourism, luxury hotels, resorts and restaurants.
- EU study - Worldwide overproduction of tropical flowers decreasing prices and lack of demand.

What does PNG have special to offer the market?

Markets

Exports

- Large scale exports of temperate flowers (East African model)
- Niche markets for tropical
- Domesticated indigenous orchids and palms

- Hotels and tourism
- Corporate sector
- Landscaping
- Local people

Fiji experience

a small industry with a large number of participants.

- Some 200 semi-commercial cut flower growers and a few small commercial growers.
- One cut flower wholesaler
- 26 florists that are registered as businesses
- 40-50 informal flower arranging businesses that operate out of their homes.
- 12 retail nurseries that sell a range of potted plants and garden supplies.
- Several hundred small growers a wide range of potted plants and trees for sale.

After this presentation the participants were divided into four groups and were asked to address the follow questions re ornamental horticulture development and then report back to the main meeting

- What are you doing
- What are your plans (what would you like to do)
- What do you see as the opportunities
- What problems do you face
- How do think ACIAR might contribute

A summary of the presentation from each group is provided in annex 2:

Grower visits

Following the meeting site visits were undertaken to four growers (indigenous orchids and heliconias) who attended Workshop.

The field visit revealed an impressive array of indigenous orchids that would likely have commercial potential. The most common orchid was Morobe Shower (*Dendrobium lineale* Rolfe), which seemed to have outstanding cut flower characteristics (seasonality, spray yield, appearance and vase life[46].

Lae National Botanical Gardens

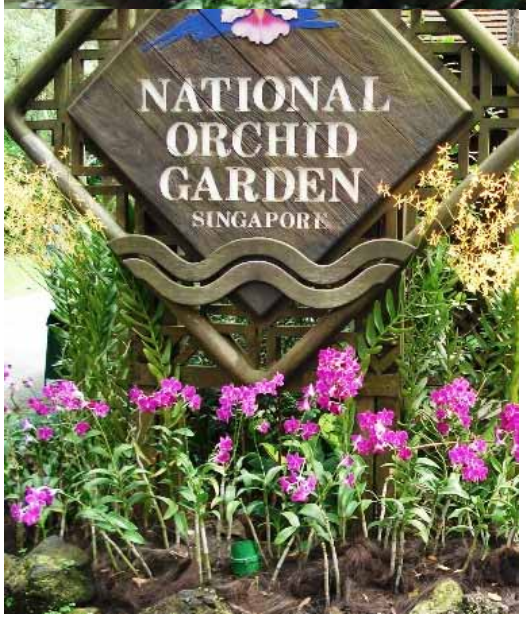
Mrs Endo Taanis Guaf the Education Officer National Botanical Gardens.

The National Botanical Gardens (NBG) covers an area of 56 hectares and is now administered by the National Forest Institute (NFI) The Lae NBG began development at its current site in 1949. In conjunction with the National Herbarium these gardens became a consolidated centre for botanical research, education, and recreation. Throughout the 1960s and 70s the National Botanical Gardens was renowned nationally and internationally. It became a major tourist attraction and an attractive recreation area for the residents of Lae. However with the abrupt decline in funding in the 1980 the condition of the Gardens rapidly declined changing from a “world class botanical reserve to a poorly maintained park in a state of disrepair and neglect” (National Botanical Gardens Development Plan 2000)[47]. Since that time there is reportedly some improvement in the state of the gardens with modest increase in the funding allocation. However, the Gardens remain a long way from their former glory and well below their potential, with the National Botanical Gardens Development Plan is yet to receive funding

[47] *The Development Plan for the PNG National Botanical Gardens, Lae. Prepared by Roderick Spivey 2000.*

In the past a significant number of 3,200 species of orchids know to be found in PNG where held at the Lae NBG. This collection has now been substantially depleted. Every year the NBG mounted an orchid expedition was sent to a different part of the country. These expeditions are no longer held.

The experience of Singapore has shown how central a thriving Botanical Gardens is the development of a ornamental horticulture industry. Such a facility has a major contribution to make to tourism and recreation amenity. It is envisaged that a revitalized NBG would play a central role in the artificial propagation and hybridization of indigenous orchids for commercial development. The implementation of the National Botanical Gardens Development Plan is seen as a priority.



Port Moresby (July 20th – 21st)

Stakeholder meeting (July 20th)

A stakeholder meeting was held at the National Research Institute Conference Room. A list of the participants is presented in annex 2. The participants included Wolfgang Bandisch, former Director of the Port Moresby Botanical Gardens, growers, florists and representatives of the National Training Council. Youths from squatter settlements interested in floriculture also attended.

Dr Jacqui Wright introduced the study and Andrew McGregor then made a presentation on Floriculture in the Pacific. There was then a wide ranging discussion on the opportunities, problems and constraints faced by PNG's ornamental horticulture industry. Some key points of discussion were:

- the floriculture trade figures significantly under estimated imports into PNG
- the need for training
- the absence of floriculture markets (in municipal markets, no floriculture markets)
- the high level of expectations for the PNG Floral Arts Society now that government was now available. (There did not seem to be any clear understanding of what the Society would do other than to hold meetings out in the Provinces.).

Meeting with Wolfgang Bandisch and Bob Tate (July 20th)

Wolfgang Bandisch is a recognized international authority on PNG orchids. He was the former Director of the Port Moresby Botanical Gardens and founder of website orchidspng.com.

Bob Tate is the Executive Officer for Papua New Guinea Forest Industries Council. The focus of the discussion was on the opportunities and requirements for developing a substantial commercial industry based on PNG's indigenous orchids. This covered:

- The types of indigenous orchids that would be suited for commercial markets. The best opportunities were identified as potted hybrid orchids – these should be small plants with large flowers.
- The most likely markets are in Asia (Japan, Singapore, China and Korea)

- In compliance with CITES these hybrid orchids would need to be artificially propagated. The plantlets would need to come from a central tissue culture laboratory from where they could be distributed to out growers who would then grow them to marketable size. These plants would then come back to a central facility for finishing and distribution to the market
- PNG already has a significant number of primary orchid hybrids that would provide a basis for starting up such an industry.

- It would be necessary to have a continuous pipe line of commercial orchids coming through the system for export. This is required to accommodate changing tastes and preferences and once an orchid has been exported it can be tissue cultured. The appropriate certification would be critical for maintaining market share.
- Bandisch and Tate are of the view that such an industry has huge potential. However they believe that the necessary investment will not occur until there is in place an appropriate policy to encourage the development of minor forest products.
- Bob Tate indicated that some members of his Council would be interested in investing in the sustainable commercial orchid development provided appropriate policy framework was in place.

Visit to road side seller along the Sogari Road – July 21st

There were some 20 sellers of pot plants located outside a large cemetery on the Sogari road approximately 10 kg outside Moresby. The sellers were mainly Highlanders from the nearby settlements. They usually only operated at the weekend, except for the Saturday's when the monthly Ella Beach craft market was in operation. The main customers were middle class people who drove out from Moresby to purchase plants. Weekly gross revenue was reported to range from K20 to K120. Some had regular customers who would come to their small home nurseries.

Meeting with Sally Napolioni (Exotic Blooms) – July 21st

Exotic Blooms operate a florist outlet in Anderson's Supermarket. Exotic Blooms have been sourcing cut flowers and foliage from 3 – village groups around Goroka for 3 years. Sally has provided training of these women with funding provided by the Small Holder Support Services Pilot Project (SSSPP).

The 3 groups are:

- The Kerefa Women's Association
- The Notofana Group
- Gilaheka Group

The Kerefa Association has 70 members (including around 15 men) that grow a range of cut flowers and leaves. Cut flowers are air freighted on a weekly basis to Exotic Blooms.

Kerefa Women's Association was the 1st group with which Exotic Blooms worked and was initiated through the group leader Margaret Harvey. It was by described by Sally as a "trial and error" process in terms of training and marketing.

The Notofana and Gipaheka Groups: These were more recently established groups and the most active. They now supply Exotic Blooms on a weekly basis. They also supply Goroka business houses. The Notofana Group has 45 members and Gipaheka Group 80 members. The Notofana Group and concentrating on tuberoses, while Gipaheka group mainly have cordyline leaves. Combined the two groups have over 45,000 plants. Both have built their own resource and training center. They were both involved in the trial shipment of leaves to Melbourne.

Trial shipment of leaves to Melbourne: A trial shipment of selection of cordyline leaves was made Melbourne in July 2006. The shipment was rejected by the Australian Quarantine (insects were found and leaf stems were not denatured in accordance with AQIS requirements). Exotic Blooms maintain these quarantine issues have been resolved and they have an approved quarantine treatment and they are ready to recommence shipments. Exotic Blooms are very bullish about this market suggesting they could supply a tonne a week to Australia and could expand their export to European markets (SSCF Pilot Project Report on the Floriculture Project for Notofana Women's Group and Gipaheka Group in Goroka, Eastern Highland). This optimistic view is not supported by the Sydney based Pacific Islands Trade and Investment Commission (PITIC) who did an assessment of Exotic Blooms Trial shipment. The PITIC report found that the landed price from Fiji and PNG where 50percent to 200percent higher than Australian wholesale prices. There were major issues of volume, consistency of supply and quality (species, colours, sizes, post harvest handling and packaging). The PICIT (2006) report notes that "post-harvest handling, refrigeration and cool chain integrity needs to be established or we can forget it". It is difficult to see how leaves from the Highlands in the present situation, could be competitive given the high cost and unreliability of freight. Exotic Blooms reports a freight rate of K7/kg from Goroka to POM (with a rate of K8.80/kg POM Melbourne which requires transhipment through Brisbane). Over the past year consignments have been off loaded an average of once every two weeks. There are no cool store facilities available at the Goroka airport. The cost of packaging is another major constraint.[48]

[48] *In 2005 the Lae based AMALPACK gave the following quotes for manufacturing carton suitable for flowers: flower packing box (medium size, 900 mm x 450 mm x 250 mm) at K10.53 per unit; and large size (1220 mm x 450 mm x 250 mm) at K12.92 per unit; and a fresh bloom box with lid (1012 mm x 140 mm x 107 mm) at K4.52 per unit. All prices based on orders of 1000 units; all prices excl 10 percent VAT.*

9.4.2 Programmed visit Goroka and Eastern Highlands (July 23rd – 24th)

A stakeholder workshop involving the 3 flower growing groups listed above was scheduled for July 24th. This had to be cancelled due to the repeated cancellation of Air Niugini flights. The unreliability of air services is symptomatic the problem of exporting perishable fresh produce from the Highlands.

A meeting was held with John Hunt the SSSPP Project Manager who provided the financial support for the training program for the 3 groups. He shared a number of reports on the SSSPP training program.

Mt Hagen and Western Highlands (July 25th – 26th)

Stakeholder workshop

A stakeholder meeting was held in the Christian Revival Church Hall Mt Hagen on the morning of July 25th. A total of 47 women from villages around Mt Hagen attended. Various participants provided an impressive set of flower arrangements.

ACIAR PNG Deputy Director Cathy Pianga assisted with the workshop and outlined the scoping study. A blackboard presentation was Andrew McGregor on Floriculture in the Pacific (a PowerPoint presentation was possible due to the failure in multimedia system). Overall the black board proved a more suitable media for this presentation.

This was a particularly enthusiastic group of participants. After the background presentation of Andrew and Cathy, the participants were divided into four groups and were asked to address the follow questions re ornamental floriculture and then report back to the main meeting

A summary of each presentation from each group is provided in annex 2:

- What are you doing
- What are your plans (what would you like to do)
- What do you see as the opportunities
- What problems do you face

- How do think ACIAR might contribute

There was a lot interest in the small holder floriculture training material that had been prepared in Fiji by South Sea Orchids with funding provided by CTA.

- Small-holder Flower Production: A Pictorial Handbook
- Floriculture in Fiji as a Small and Micro Business

Copies have been sent to representatives of the group. The meeting agreed that this group will make a request to prepare similar training material for tuberoses grown in the highlands. They are keen to participate in a Fiji study tour proposed by USP/IRETA for 2008. A number of group leaders have been identified who benefit from such a visit.

Port Moresby (July 27th – 28th)

Meeting Mr Barnabos Wilmot (Manager Wildlife Enforcement Dept)

The focus of discussion was on commercial development of indigenous orchids.

All PNG orchids are covered by Appendix 2 of CITES and there trade is regulated by a 2003 Act of the PNG Parliament. Under current regulations orchid propagation must originate from collected seed. This poses a major constraint in terms of the infrequency of flowering and the long lead time propagating from seed. However, according to Wilmot propagation by tissue collected from the wild could be considered on a case by case basis if it can be demonstrated that this will contribute to the conservation of the species.

To export an orchid under CITES it needs to demonstrate that it did not come from the wild. F2 hybrids are no problem – F1 hybrids could be considered on a case by case basis. A propagation protocol would have approved by the PNG CITES Management Authority in the Department of the Environment. Such a protocol should be developed in conjunction with the Department.

According to Barnabos a draft policy on Minor Forest Products had formulated few years ago with financial and technical assistance from the EU. However, this was not taken up. However, according to Kanawaii Pouru, the Managing Director of the PNG Forest Authority, there is a need to formulate and enact an appropriate policy.

Barnabos is of the view that the smuggling of indigenous orchids out of PNG is rampant. He believes that the detection rate is about 1percent. There is no detection infrastructure or equipment at the air and sea ports and they rely entirely on tip offs to catch people. There is not restriction on importation of orchids into PNG.

Meeting with Romius Waki, Gelm Limited

Romius is from Goroka but is working in POM with AusAID. He is an environmental scientist by training and is involved with the development of an integrated development in his home area of Komiufa area in the Eastern Highlands. This includes a substantial floriculture component. He has had discussions with a Singaporean investor who is interested in a joint venture for rose development

Meeting with Peter Cusak. International Finance Corporation (IFC) PNG Country Coordinator.

The IFC sponsored the PNG floriculture study tour to Fiji in 2005. The PNG Floral Arts Society was created to facilitate the trip to Fiji. He is disappointed that there have been

tangible benefits following from the Fiji visit. The Association has not been operational with the participants dispersing to do their own thing. There was no attempt made to develop an SSO type model in PNG, which was one of the objectives of the Study Tour. IFC have not had any large scale investor interest in floriculture development.

Meeting with Anton Benjamin. Secretary Ministry of Agriculture and Livestock (MAL)

We discussed Floriculture in Ministry's White Paper on Agriculture (2005-2014: Toward National Food Security) and in the National Agricultural Development Plan (2007 – 2016)

The White Paper contains the following entry re Floriculture.

Flowers, like many agro-forestry plants, provide fragrance use in pharmaceutical industry to produce essential oils, perfumes, cosmetics, and ornamental decorations. Flower oil marketing is commercially viable in other developing countries when supported with adequate processing and marketing facilities.

Many orchids varieties found in the country are unique to PNG. Each habitat has its own orchid flora. Some species are widespread in areas with similar habitat; while others are confined to very restricted localities. Many orchids have considerable horticultural potential. Repeated sectional and intersectional crossing and backcrossing to generate newer types has almost limitless possibilities.

Policy Statement

The Government shall promote floriculture to supply niche market.

Policy Objectives

- To encourage more participation of individuals and farming communities in floriculture.
- To provide incentives to encourage private sector investment in the floriculture industry.
- To encourage post harvest technology development including preservation, processing and packaging of various flowers for local and overseas niche markets.
- To develop market access for export of native flowers.

In the National Agricultural Development Plan floriculture is included in the as part of Horticultural Crop Development as Objective 5. It states:

To develop the floriculture industry in PNG

Strategies

- Assessment of opportunities, constraints and potentials of the various types of flowering plants for floriculture industry in PNG. This will involve a nation wide survey that was to be conducted in 2007 (yet to be undertaken). K700,000 budgeted in 2007.
- Promote floriculture and capacity building for women and youth in rural and peri-urban areas. This will involve 4 awareness trainings a year per region. K2.05 million budgeted over 10 years, with K250,000 in 2007
- Identify funding sources for reviewing the floriculture industry in 2007 (funding yet to be identified).
- Increased production through establishing regional nurseries and distributing cuttings. The target is one nursery in each region with 30,000 cuttings distributed per year. K400,000 allocated per year over 10 years
- Identify domestic and export markets for the cottage floriculture industry. K300,000 allocated per year over 10 years.

The National Agricultural Development Plan has a total notional allocation to floriculture development activities of K9.75 million, K700,000 included MAL's 2007 Budget. These funds will largely be used to conduct national and regional meetings the PNG Floral Arts Society. A launch was programmed for Sept 2007.

Visit to Ella Beach monthly craft fare and plant sale (July 28th)

There were around 15 put plant and cut flower sellers at this monthly event. For most this was there main market outlet. There sellers reported that they earned K100 to K250 after deducting their entry fee and transportation costs. The sellers were also the growers of the plants and most came from settlements around POM. Some of the sellers were also present along the Sogeri road the previous Saturday. They found the Ella monthly market much more remunerative, with many more buyers present.

9.5 Australia Trip Report October 7th-14th 2007

Meeting Date & Time	Contact	Place
Tuesday October 9th, 2007 2:00 pm	Jan Hintze Jungle Plant and Flower Farm 89881771	Darwin City

Jan picked me up from the airport and we had lunch on Mitchell St. in downtown Darwin. Jan proceeded to give me an overview of the cut flower industry in Darwin. Within an hour of Darwin there are15 full time growers and 15 part time growers. Main flowers grown are gingers and heliconias for sale to domestic and export markets. There is also small scale orchid and anthurium production almost entirely for the local Darwin market. There is one major wholesaler who buys from about 12 growers and exports interstate to wholesale markets. He is responsible for about 80 percent of the flowers coming out of Darwin. Jan also exports interstate about three times per week depending on availability of freight space. It is illegal to import gingers and heliconias into Australia to protect the ginger spice industry, so it is a closed market. Darwin and N. Queensland are the primary producers of gingers and heliconias. For the ginger and Heliconia segment N. Queensland does about twice as much as Darwin, main production areas are Cairns and Townsville.

NT Horticulture Association and Cut Flower Group is the industry organization supported by the Australian government, there are 3 industry officers located at Coolinga. Meetings

are held every couple of months and the group works together to develop research projects, share information, sell plants to each other etc.

There are three main markets where growers can sell directly to customers. Only about 5 women sell directly to customers at these markets. Jan explains that conferences are a very unique way to sell flowers, when a conference is going on you approach the group and display your product and then deliver on the day they are leaving. There is usually a lot of people with a lot of money who need to buy presents but don't have much time. It is important that your customers are really interested in flowers if they are going to just by the cut flowers, good to have communal flower arranging demonstrations at churches, halls etc. Very important is the quality control issues – you must be prepared that you are not going to sell all of your flowers. You might get only one shot with some of these customers and if they are getting poor quality you lost them for life. Jan is attending the Ginger flower festival at Yandina on the Sunshine Coast at the end of January or beginning of February.

Meeting Date & Time	Contact	Place
Wednesday October 10th 8:30am	DPI Horticulture staff – Megan Connelly, Mark Hoult, Doris Marcsik	DPI JEB meeting room

Megan Connelly – Extension officer
Doris and Mark – Research and Development

DPI has engaged in breeding with Zingibers, Psitocorums, and more recently cucurmas. Breeding program is very interesting with different breeding techniques. The pisitocurm basically involved sowing a whole bunch of different seeds and then looking for new traits to come up. The zingiber breeding was more in depth and involved actually crossing parents, the new varieties that were developed were named and licensed under PBR, these rights were then sold to a group of growers which formed a company and it became their responsibility to grow, multiply, market, and sell the plants and to maintain the PBR license. All of the information including costs and structure of this project were made available for our use. Cucurma breeding was done along those same lines and these were primarily for the potted plant sector, they have beautiful colour and could be used as plant hire, in the landscape or sold at plant sale events.

Whether DPI have bred the species or are just introducing it, they do intensive screening and evaluation of the plants. Assessment is based on performance in a particular environment, time of flowering, stem length, vase life etc.

We discussed the possibility of importing materials from Darwin and it became apparent that what we really need is a survey of all ginger and Heliconia varieties that are available in Fiji. Along with the survey could be evaluations looking at size of the flower, keeping quality, flowering season and many other characteristics. This could be done on behalf of the FFC and then all of the information made available to all the growers, this would be very useful if growers are considering importing gingers or heliconias because they might be spending a lot of energy to bring in something that is already there. There is a lot that can happen with quality standards if these are outlined in an informational sheet.

I was also given a list of nurseries and other contacts that will be very useful in developing these ideas.

- David Dow has done a lot of work in Bali to commercialize indigenous orchids and other plants and will be a contact for our PNG work.
- There is a guy named Tony from N. Queensland who has a good tissue culture facility for gingers and other tropicals.

Mark explained that he believes Adeniums would be a very popular ornamental in Fiji and the Pacific. These plants which are native to South East Asia have hundreds of different colours and are easily imported via seed.

Meeting Date & Time	Contact	Place
Wednesday 10 October 10:30am	Diagnostics staff: Brian Thistleton (Entomology), Barry Conde (Plant Pathology), Jose Liberato (Plant Pathology).	DPI BAL Building

The biggest issue with relation to the ornamentals industry is this Fusarium wilt related to Banana that attacks some Heliconia varieties especially ‘sexy pink’, they think that it is directly related to the genome of this plant. Many Heliconia varieties are not susceptible. We must be very careful when importing heliconias from Australia because chances are that it has the Fusarium. If we can bring them in under TC than we might be alright.

There is also an Alpinia Borer that hollows out the stems. You can tell its damage because the new leaves begin to die off and then the plant slowly dies off. They have a chemical control that has to be applied every week for four weeks in order to make sure and get the insect in all of its life cycle. They are also working on some pheromone trials to control this insect.

Related to our problem of Red Ginger Decline. They suggest a project that looks at all the possible causes with the most obvious first.

- Nutritional deficiencies – potassium
- Pythium spp.
- Nematodes

Some suggestions for addressing each of these possible causes are:

Nutritional deficiencies – potassium

- Analysis of healthy and sick plants through field trials – move some of the sick plants to a new site and see of they still exhibit the same characteristics.
- Analysis through lab tests of the plant matter from a healthy and then a sick plant.
- Plus and minus fertilizer field trials to see how the sick plants respond, use a high potassium fertilizer (banana fertilizer).
- Even if we decide that this is a nutritional problem, there are a lot of trials to be run to determine how much is the right amount of fertilizer, when should we apply it etc.

Pythium spp.

- A lab analysis to isolate and culture it on plates and send it off to a pythium specialist for testing.

Nematodes

- Sampling of sick and healthy plants for the presence of nematodes and then send them off to a nematode specialist.

Meeting Date & Time	Contact	Place
Wednesday 10 October	Scott McDonald School of Science & Primary Industries 89467254	Charles Darwin University Casuarina campus

Meeting with Scott McDonald was in response to the need for skills development in the ornamental horticulture industries in the Pacific. Charles Darwin University in Darwin offers courses in Horticulture from the certificate level right through to a Diploma. Certificate I level covers the basic skills with an intro into the science of soils, propagation, botany etc. When you graduate with a certificate you are termed a skilled labourer. When you enter the certificate II course you specialize a bit and graduates can be termed as horticulturists, this was previously considered the 'trade level'.

What seems to suit our situation in Fiji is a competency based training program. This can be achieved through a series of 'skill sets' which cover the entire range of units necessary to attain a certificate. Each skill set can be offered as needs based training; combining the relevant units to be taught as a stand alone skill set e.g. Grounds Management, Nursery Management, Cut Flower Production, etc. A participant can attend one skill set related directly to his/her field and receive a certificate of attainment for those units. The other option is to attend all of the skill sets and at the end the participant receives a Certificate II in Horticulture from the respective University or training provider.

It is assumed that this training program will be short term with an emphasis on capacity building in the area of ornamental horticulture. Thus, faculty from the Fiji College of Agriculture, USP, and staff of MAFF will be encouraged to attend. This foundation of training will equip its participants with the skills to advise, implement, and eventually instruct other members of the industry.

A potential framework for such a project is as follows.

- A training provider is identified that has the appropriate staff to deliver horticultural training with an emphasis on tropical ornamental production. The staff must be equipped to handle the unique cultural classroom dynamics. Possible providers identified through this trip were Charles Darwin University located in Darwin and North Queensland Institute of Tafe based in Cairns. There is also a range of private training providers that might be suitable for such a project.
- The certificate program will be run as 'skill sets' with 4 units of competency covered in 4-5 training blocks, each lasting around two weeks.
- Training blocks can be offered at different sites depending on the focus of the units e.g. Cut Flower production can be at SSO in Nadi, Grounds Mngt can be at a resort on the Coral Coast etc.

Meeting Date & Time	Contact	Place

Thursday 11th October 8:30am	Evert, Ironstone Lagoon Nursery	Berrimah

Ironstone is a large retail and wholesale nursery supplying a diversified range of plants from over 1000 species. Of particular interest was the potting soil that this nursery used. A range of ingredients were brought on site including composted green waste from the city municipal dump, river sand and coco peat. An old cement mixer was used to blend these ingredients which were then steam sterilized inside of the mixer. This type of soil sterilization is part of a set of best practice package that many of the nurseries in Australia adhere too.

Also of interest was one of the types of potting bags used by this nursery, these bags were thick woven plastic (like our rice sacks) with handles on either side, there were some with round bottoms and some like the traditional PB bags used in Fiji. These were preferred by the nursery in many cases because they were easy to lift (either by hand or machine) and also easy to ship and store. A couple of brands and suppliers were recommended to me.

This nursery has had some recent dealings with resort developments in Dubai however there have been problems with plant brokers and owners which has meant that there are a lot of plants grown for the development that might not be shipped.

Shadehouse construction at this nursery was of several styles, one being the hoop house and the other being similar to the type of construction used in Fiji for cut flowers. A few little alterations make this design unique and long lasting.

Meeting Date & Time	Contact	Place
Thursday 11th October 10:00am	Ian & Irene Hennessy, Hennessy Flowers	Elizabeth Valley

Ian has set up a tissue culture lab in a modified shipping container on his Elizabeth Valley property. The facility is well equipped and has had considerable investment in terms of time and money. The initial concept for this facility was to propagate new cut flower cultivars for distribution to other growers. The lab has been going for about 3 years now and Ian has been successful in propagating gingers and one type of Heliconia. The plants he has propagated in TC have grown out and are healthy full size plants. Up until this point he has primarily been concerned with proving that the technology does work at his facility. Ian is now interested in taking orders for small amounts of high quality plants.

Ian and Irene's ginger and Heliconia farm is very well maintained. They supply one main wholesaler who buys 3 times a week and will take anything they can supply, the quality standards of these flowers are very high. This wholesaler purchases about 80percent of the flowers produced in Darwin. Along with the wholesaler, Ian and Irene also sell to one local florist, one person who goes to the Saturday market, and several shops and business houses as ready made arrangements.

The ginger and Heliconia beds are well maintained with a ride on mower for in between the rows. All of the plant material that is cut is left in the rows to serve as mulch and compost. Ian attributes the good organization of his farm to the wide spacing that he uses. There are very few problems that they face except the occasional sun scorch or chilling injury characteristic of this dry tropic climate.

Ian has a wide range of Heliconia varieties that do very well at this site. Ian likes the darker colour varieties because they do not show scratches and damage as easy. The claws are the hardiest of his plants. Heliconia 'Richmond Red' is a beautiful dark red variety that has a very superior flower, I don't believe that this variety is in Fiji.

Meeting Date & Time	Contact	Place
Thursday 11th October 1:30am	Darryl South, Darwin Plant Wholesalers	Lambell Lagoon

This is the largest nursery in Darwin. They have and incredible system for shipping plants to states around Australia. Currently about 70percent of sales are made out of Darwin with the remaining 30percent to the local market. DPW is strictly a wholesaler.

The potting mix used is made up of coco peat (imported from Sri Lanka), river sand, and peat. The nursery is very well mechanized with potting machines, this is necessary

because there is a real shortage of labour in this area. The farm is about 40 minutes drive from Darwin City.

Of particular interest at this nursery was the wide range of frangipani varieties for sale. Fangipani is this nursery's single biggest product. Many of these varieties have been imported with assistance from DPI and some have even been bred in Darwin. Daryl has been very creative in getting these plants and then renaming them and marketing them with this new name, there is a "Darwin Series" that is very popular in the southern states. This year DPW has sold between 80,000 and 90,000 frangipani plants alone.

The production technique for frangipani was described to me as follows;
Cuttings of about 3-4 inches are taken from dormant mother plants around June or July. These cuttings are then held in a cool shady place with paper wrapped around them for about 3 days. It is important to get the sap to stop flowing however you do not want them to dry out too much. The cuttings are then planted into a very well drained mix and watered regularly. These plants will then flower around October and can be sold flowering or grown out for a season and sold the following year a little bit bigger.

Daryl also recommends the use of the woven plastic bags for certain situations; he gave the following contact for sourcing these bags and a range of other products:

- Steve Turner, Wongara Horticulture, Perth, 93025200

Meeting Date & Time	Contact	Place
Thursday 11th October 3:30am	Simon Smith, The Plantsmith, 0408897059	Howard Smith

Simon's business is based primarily on potted colour. He brings in plugs from Queensland and then grows them out and sells to the retail outlets. His primary plants are: catheranthas, turinia, marigold, impatiens (New Guinea), gerberas, begonias, coleus etc. He said that he purchases around 500 plugs for $30 from N. Queensland. He also recommended a number of plants that he believes we should look into.

Simon is one of the growers who was given the cucurmas from Doris and is supposed to be propagating them and releasing them to sell. He said that he is having trouble getting someone who will tissue culture them.

Simon is president of the NT Nursery Association, he suggested that we become members of this association. He gave a catalogue of grower and supplier names in Australia for further contacts.

Meeting Date & Time	Contact	Place
Friday October 12th 2007 8:30am	DPI Horticulture, Pathology and Entomology staff – Megan Connelly, Mark Hoult, Doris Marcsik, Brian Thistleton, Barry Conde, Jose Liberato	DPI JEB meeting room

In this meeting we attempted to wrap everything up and address any remaining issues. Barry Conde from the plant pathology department expressed his interest in being part of a team to explore the possible causes of red ginger decline. He has recommended a 3 year project to examine all possible causes; nutritional, pythium, root knot nematode. He has proposed his contribution as 3 weeks per year for 3 years. We discussed the process for implementing this project and tied it into nutritional work that Mark and Megan have been involved in with Alpinias.

We then discussed some possible structure set ups for the FFC using lessons learnt from the Australian experience. It was recommended that we work towards combining the cut flower and nurseries into one association at least in the early stages. They expressed their opinion that a paid secretariat was the only way to proceed; this secretariat would create a new face for the association and umbrella everyone (commercial growers and hobbyists). With relation to the Government and their involvement, they suggested getting what we can and then tell the government exactly what you are going to achieve in one years time (make it realistic) and the go for it, a success at this level will make them take the FFC seriously.

Among the many things that are proposed for the FFC it was clear that they should work towards getting sound information for the crops and varieties that are grown. The DPI has done this kind of work and calls them CDL's (crop description lists). This baseline information is made available for any growers who are interested. In particular a survey of the gingers and heliconias found in Fiji with some basic evaluation i.e. flowering times, stem length, vase life etc.

There are also many production practices known as 'best practices' that are common to cut flower and nursery production, these can be outlined and prescribed to all members of the FFC.

Meeting Date & Time	Contact	Place
Friday October 12th, 2007 2:00pm	Jan Hintze, Jungle Plant and Flower Farm, 89881771	Lambell Lagoon

Jan's farm at Lambell Lagoon is on a property of 20 acres. The land was formerly a commercial nursery however Jan now uses it to grow gingers, heliconias, costus and cucurmas. Currently there is about 10 acres under production.

Touring the farm you are continuously surprised at all the different colours and varieties of flowers grown. Jan has 8 different torch gingers all of different colours from white to dark red and all the pinks in between. Jan explains that each of these varieties has a vase life of atleast10 days. I saw another unique Alpinia called A. spisiosa that has bell shaped flowers and takes on its most attractive appearance when the outer bracts are carefully pulled back. The main foliage that Jan growers is Alpinia galangal which is primarily grown as a spice however it also has an incredible vase life and the leaves do not curl. Another unique ginger was the tulip gingers which look like the torch ginger except they do not open. Jan grows a range of 'beehive' or 'shampoo' gingers with colours ranging from white to dark chocolate. Some of these beehive gingers are closed bract varieties and

therefore will never open. Jan explained that the best way to determine maturity is when the day flowers are coming out on the third and fourth bracts.

Helionias is Jans real passion and this is very evident in the huge range of colours and sizes. A variety called H. orthotricha is very unique and not widely available in Fiji, if available at all. H. orthotricha comes in many colours and combinations of colours and is a very strong, clean looking flower that can have up to 10 bracts and span more than one foot wide. Jan recommends these flowers be developed in Fiji as they are a favourite of the wholesalers and street marketers. Claws remain the primary Heliconia that Jan grows and she usually sells them with 3-4 bracts open. Other heliconias that really stood out were a pink claw variety, a flower called 'hot rio night' which twists in a serpentine fashion and has a really unique appearance. Jan has observed that some varieties of heliconias that twist in this serpentine fashion can be encouraged to do so by the addition of a high N fertilizer. Jan suggests that this contortion is a result of the hybridization of upright and pendulum varieties, these flowers are very unique and would stand out well in hotel and office arrangements. *H. bourgeana* is another variety that is worth mentioning; this flower is a true red and has unique cup shaped bracts.

The other secondary crops grown at Jan's farm were the cucurmas and costus. Cucurmas were one of the crops that Doris from DPI has been breeding and Jan has a collection of these hybrids. There is also an indigenous cucurma that is very beautiful. In the conditions in Darwin all of the cucurmas go dormant during the dry season which is also their winter. As the wet season starts to roll around, October-November the cucurmas start to come up again. Some of the varieties will flower before they get any foliage, other varieties will get some foliage and the flower. Doris was initially breeding these plants to use as cut flowers but has found that they have great potential as potted colour and in landscapes. The costus is a small flower that grows on canes in a similar fashion as alpinias, the flowers will either open or remain closed looking like a strawberry depending on the variety. Costus also have quite unique foliage, especially near the top of the growth where some of the colour from the flower also appears in the leaves.

Many of the Heliconia varieties that are present at Jan's farm are the result of seed brought into Darwin and grown out. There is an incredible amount of variation when growing heliconias from seed and this is one of the reasons that the growers in Darwin have so many unique varieties. Jan shared the basics of propagation of heliconias from seed beginning with collecting, germinating and growing out. Jan reckons that most Heliconia varieties will germinate from seed in about 6 weeks with some taking as long as 14 months, from germination to first flowering is about 2-3 years; these figures were confirmed by Ian Hennesey and Doris.

With regards to production, harvest and postharvest handling there were some great lessons learned,

although there are many practices that will not directly apply because the climate is quite different in Darwin to that found in the South Eastern parts of Viti Levu. Jans whole business is focused around quality control, she believes that every flower has to be of the highest quality whether it is for shipping interstate or sold at the local market. This was reflected in the flowers being held in the geodesic dome that is her packing house, there was great uniformity in maturity, height and overall appearance. Jan also practices heavy mulching with the parts of the plant that she does not remove for sale. Almost all of the cleaning of dead leaves and excess plant matter is done in the field and everything is left there, this provides a layer of mulch and helps to return the nutrients in the plant matter back into the soil.

Meeting Date & Time	Contact	Place
Saturday October 13th 2007 7:00am	All flower and potted plant vendors	Parap market

The Parap market is the largest street market in Darwin. There are a wide range of vendors selling fresh produce, hot food, handicrafts, and ornamental plants. In total there were seven plant vendors at the market; four selling potted plants exclusively and three selling cut flowers and potted plants.

The potted plant vendors had a range of common and exotic ornamentals not much different than what is sold by Fiji growers. A few differences between the potted plant vendors in Darwin and those in the Pacific were that they did not just have one of any type of plant, there was always 4-5 of a particular plant type. The second major difference was the selling price of the plants, at the Parap market plants started at $1 and went up to $50 for a flowering orchid. Generally the plants sold at the market in Darwin were much less expensive than those sold in the Pacific.

Cut flowers were sold at the Parap market as individual stems or in bouquets. There was a wide range of Heliconia types available, especially at Jan Hintze's stall. The maturity and quality of the flowers for sale was very uniform throughout the market and of a high standard.

There was only one vendor with orchid cut flowers and plants. He is relatively small scale and supplies just the local Darwin market. His primary income earning activity is importing TC dendrobium orchids and growing them out for sale as flowering plants. He sources all of his dendrobium orchid material from Thailand and reports that they are very consistent and cheap.

9.6 Workshop Final Report

9.7 SPC/ACIAR Workshop on Developing the Ornamental Horticulture Industry in Fiji

20th August 2007

Main Hall at Butt St .Church. Suva Fiji

9.7.1 Overview

The workshop was attended by 58 people representing various sectors of the Fiji Floriculture Industry. A complete list of the participants and the organization they represent is provided as annex 1. The workshop was officially opened by Mr. Sakiusa Tubuna, the Chief Economist from the Ministry of Agriculture (MAFF). Mr. Tubuna expressed his appreciation for the initiative taken to develop this industry and pledged the full support of MAFF in pushing this industry forward.

The agenda for the workshop is provided as annex 2, in total there were 9 speakers. A primary focus of the workshop was to present the findings from the ACIAR Scooping Study on the Income Generating Opportunities: Fiji Case Study, this report was well received by the participants. The general comments from the floor were in support of the conclusion that the real potential for developing the Fiji Industry lies in the domestic tourist and non-tourist market.

The findings from the Survey of Tourist Industry Operators were presented and discussed in depth. There was particular discussion from the floor regarding this matter as several of the private sector participants have been trying to engage the hotels with floriculture products for the past 12 years with very little success. The Managing Director for Tadra Flowers supported the findings of the survey and added that their experiences with regards to hotels and payment was credit of 60-90 days or greater. He also supported the conclusion that unless the industry offers the hotels something that they cannot do themselves there is very little room for growth. This is highlighted by Tadra Flowers sales to hotels of dendrobium orchids and anthuriums only as requested by their guests. The hotels have not been able to effectively and efficiently produce these cut flower types on their own premises. When opened up to the floor, there were several suggestions made about how we could 'crack the tourism sector', all of these suggestions revolved around a body that acts on behalf of the industry with adequate time and financial resources to implement these strategies.

The discussion of what plants are suited to Fiji's conditions was particularly well received by the participants. There was real interest in the prospect of growing roses in Fiji. Mr. Burness, who presented on this subject, brought forth the results of a feasibility study done on rose production in Fiji. The report generally said that it was not feasible to do commercial scale rose production for the export market; however, with the right variety Fiji might be able to produce adequate roses for the domestic market. Participants, including florists and flower arrangers were excited about the prospect of more affordable roses, however, Mr. Burness made a point that these flowers would not be the same calibre as export types and that the industry would have to change its perception of the rose in order to fully adopt this product.

There was also great interest raised about the possibility of importing new varieties of ornamental plants. Mr. Burness stressed that people are always looking for something new and will be willing to pay dearly for new or exotic flowers/plants. Photos of new varieties of bromeliads including Guzmanias were shown to the participants and were received with great enthusiasm. These plants were described as being very well suited to the potted plant hire business. Finally, new varieties of gingers and heliconias not available in Fiji were displayed in photos and ignited great interest from growers, florists and flower arrangers. Gingers and heliconias are the backbone of the floral art segment of the industry and make up the majority of floral displays. The prospect of importing some of these new varieties would have an impact on many small businesses.

The representatives from Fiji Quarantine and Plant Protection were well received and their presentations were informative. The discussion that followed was very productive in that there were questions from the floor and answers from the representatives. A few participants took the opportunity to voice their complaints regarding the inefficiency of the government services; the response from the presenters was cordial. An important point that was raised was that these government services were there for the industry however many of the activities, such as facilitating importation of new planting materials, were time and resource consuming and therefore not feasible to undertake for every 'backyard grower'. It was therefore recommended that a body representing the industry consult with the stakeholders and engage the government agencies with requests that are viable and represent the interest of many stakeholders.

The dynamic presentation of Marika Tuiwawa, Curator of the Regional Herbarium, was a highlight of the workshop. Mr. Tuiwawa pictorially described that potential that lies in Fiji's native plants. These plants have limited potential in the domestic market just as they are, however, according to Mr. Tuiwawa there is unlimited potential when these plants are used in breeding programs and CITES approved for export. Mr. Tuiwawa identified many orchid and other species that he believed were well suited to this type of development. He also identified the lab at SPC, Suva and another in New Caledonia that could be possibly facilitate such work.

In the final discussions of the day it was endorsed by the participants to reactivate the Fiji Floriculture Council (FFC) and make it more commercially orientated. It was also endorsed to pursue funding for a small secretariat that would allow the FFC to actively pursue the priorities of the Fiji industry.

Participant List

SPC/ACIAR Workshop on Developing the Ornamental Horticulture Industry in Fiji

20th August 2007 Main Hall at Butt St. Church Suva Fiji

Name	Organisation
Mike Waters	Tadra
Ana Roseville	Florist
Agnes Balawa	Palm Court Florist
Ula Tiko	Florist
Aileen Burness	SSO
Don Burness	SSO
Debbie	SSO
Lily Powell	Grower
Maureen Chang	Grower
Pelenaisa Luma	Grower
Lori Morris	Grower
Sue Clark	Grower
Sala Derenalagi	Grower
Verona Lucas	Grower
Ana Mackenzie	Grower
Dr Laisa Naivalulevu	Grower
Ropate Ligairi	Fiji College of Agriculture
Paula Waqainabete	MAFF Fiji
Sakiusa Tubuna	MAFF Fiji
Name	Organisation
Ateca Cakautini	Quarantine
Ravi Shankar	Quarantine
Moti Lala	Plant Protection KRS
Losalini Toganivalu	Plant Protection KRS
Savenaca Nacanaitaba	NCSMED
Mitchtoshi Yagita	NCSMED
Mary Taylor	SPC
Eddie Stice	Fruits of the Earth
Steve Yam	Hop Tiy
Kalara McGregor	Koko Siga Landscapes
Shanti Devi	SOHC
Milika Vuli	SOHC
Sera Tupua	SOHC
Losana Naulumatua	SOHC

Seini Duri	SOHC
Fane George	SOHC
Prem Andrews	SOHC
Manowar Gounder	SOHC
Teresa Manuel	SOHC
Satya Singh	SOHC
Elizabeth Pickering	SOHC
Lavenia Padareth	SOHC
Adi Koila Nailatikau	SOHC
Name	Organisation
Andrew McGregor	Koko Siga
Adi Matai McGregor	Koko Siga
Timote	Grower
Kyle Stice	Koko Siga
Reapi Masau	SPC
Bale Venilove	Koko Siga

SPC/ACIAR Workshop on Developing the Ornamental Horticulture Industry in Fiji

20th August 2007

Main Hall at Butt St .Church. Suva Fiji Phone: (679) 33 05 844 Fax: (679) 33 05 668

9.8 Agenda

Time	Activity	Presenter
0830 – 0900 Registration		
0900 – 0915	Official opening	Sakiusa Tubuna Chief Economist MAFF
0915 – 0930	Role of SPC and regional partners in developing ornamental horticulture in the region	Mary Taylor (SPC)
0930 – 1000	Overview of the report – Where have we come from and where are we headed?	Andrew McGregor (Scoping Study Coordinator)
1000 – 1015 Discussion		
1015 – 1045 Coffee / Tea Break		
1045 – 1115	Status of the Fiji Industry – A small industry with a large number of participants. Survey of hotel operators	Kyle Stice (Horticulture researcher)
1115-1140	Linking floriculture with tourism – A report on a recent visit to the Hawaii industry	Aileen Burness
1140 - 1200	What plants are suited to our conditions	Don Burness (Horticulturist)
1200 – 1230 Discussion		
1230 – 1330 Lunch		
1330 – 1400	The potential of Fiji's native plants – Love them or lose them	Marika Tuiwawa (Curator – Regional Herbarium)
1400 – 1415	Our pest and diseases status	Losalini Toganivalu (Senior Research Officer, Plant Protection)
1415 – 1430	The role of Quarantine in assisting and protecting the Fiji industry	Mere Salusalu (Fiji Quarantine and Inspection Service)
1445 – 1515 Coffee / Tea Break		
1515 – 1600	The way forward	Andrew McGregor (moderator)