The export of horticultural and high-value agricultural products from the Pacific islands

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Quarantine restrictions are major obstacles to agricultural exports from the Pacific island countries to developed country markets. The paper points to the best developed country market prospects for Pacific agricultural exports if the quarantine barriers can be overcome. It also discusses the most important plant quarantine issues and what needs to be done to overcome these problems so that the export markets can be developed. A recommendation is made for a Pacific-wide, scientific and technical assistance effort to promote agricultural exports from the region and allow the region to participate in the rapid global growth in trade in high-value agricultural commodities.

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A global perspective

A revolution is occurring in the export of horticultural and other high value agricultural products from developing countries. Overall, high-value products (including horticultural products, livestock, cut flowers, and organic products) now make up some 65 per cent of all developing country agricultural exports (United Nations Commodity Trade Statistics Database). The real value of traditional commodity exports fell dramatically from 1980 to 1990 (Figure 1). Since then there has been some recovery but the total export value remains considerably lower than what it was in 1980. In contrast, over the last twenty five years the value of horticultural and other high-value product exports has grown rapidly, with developing countries gaining a dominant market share for such products. For example, in 2005, developing countries held a 56 per cent share of world trade in fruit and vegetables (excluding bananas and citrus). The value of exports from the fruit and vegetable group in 2005 accounted for 30 per cent of all developing country agricultural exports, compared with only 16 per cent in 1980, and has now surpassed that of traditional commodities (Figure 1).

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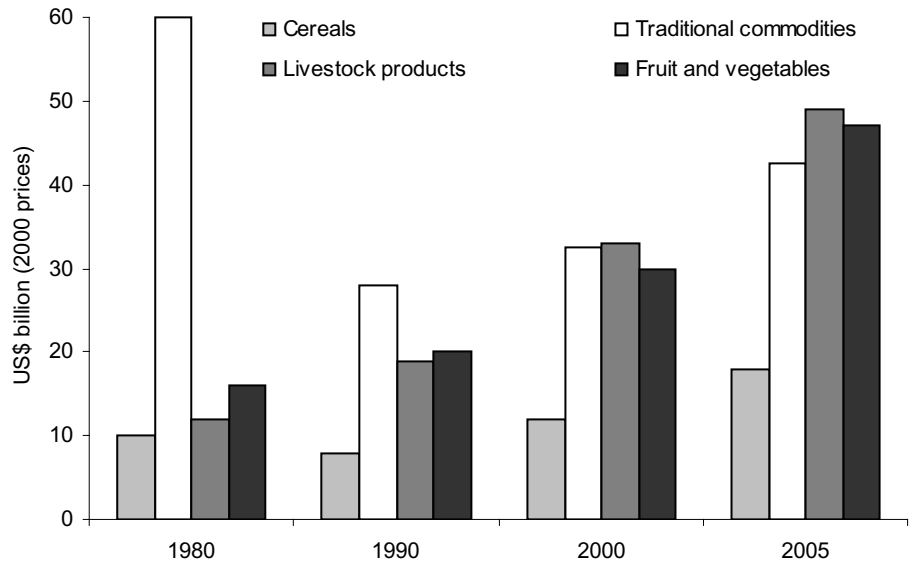
For many developing countries, producing horticultural commodities is becoming an important mechanism for growth and poverty reduction through boosting incomes and employment.[1]

The Pacific island countries—not a part of the global horticulture revolution

The total value of the Pacific island countries' non-commodity agricultural exports to all markets in 2005 was around A$65 million (Table 1 and Figure 2). To put this in perspective, the region's total exports to Australia in that year stood at around A$2,640 million. Taro, squash, noni juice and vanilla beans are the most important non-commodity agricultural export products from the Pacific island countries. This poor export performance is particularly disappointing, considering

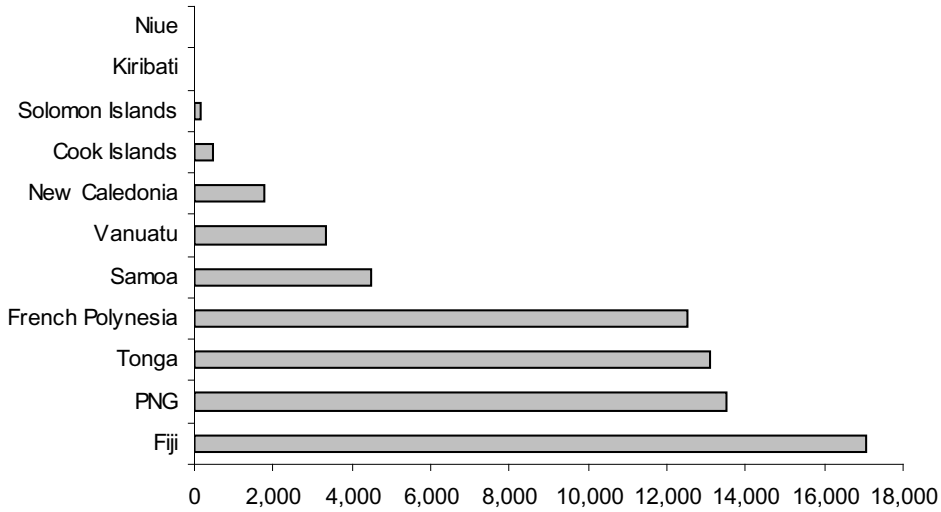
- these are agriculturally-based economies
- often highly suitable agro-ecological conditions can be found (for example, the Highlands of Papua New Guinea for temperate fruit, vegetables and floriculture products and western Viti Levu, Fiji, for tropical fruit)
- the impressive global growth performance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

Figure 1 **Value of developing country agricultural exports, 1980–2005**



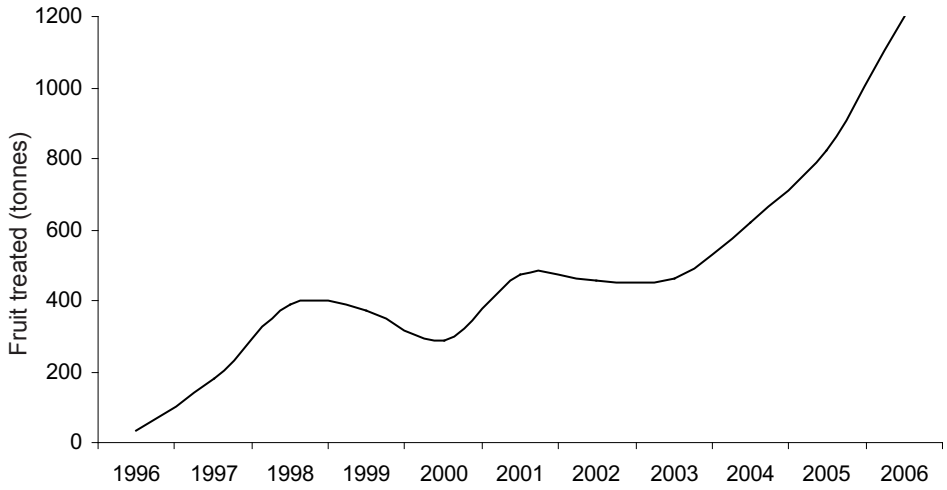
Source: United Nations Commodity Trade Statistics Database.

Figure 2 **Approximate value of all Pacific island country non-commodity agricultural exports, 2005** (f.o.b., A$ '000)



Source: United Nations Commodity Trade Statistics Database.

Figure 3 **Fiji's exports of fruit fly host products, 1996–2006** (tonnes)



Source: Nature's Way Cooperative (Fiji) Ltd.

Table 1 **Non-commodity agricultural exports from Pacific island countries, 2005**

Country	Market	Approx value (A$ '000)
Fiji		
Root crops	Aus/NZ/US	12,500
Root ginger	NZ/US/Euro	845
Papaya	Aus/NZ/Japan	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/Japan/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/Japan/Euro	10,000
Sub-total		13,500
French Polynesia		
Noni juice	USA/Aus/Japan/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
Total		66,416

Source: Derived from Australian Department of Foreign Affairs, Stars Data Base; Pacific Islands Trade and Investment Commission (Auckland); US International Trade Commission's online ITC Trade Dataweb (http://hotdocs.usitc.gov/docs/tata/hts/bychapter/0612HTSA.pdf); Pacific Islands Trade Centre (Tokyo) (www.pic.og.jp/en/stats/htm) ; Japan Tariff Association data supplied by Asian Markets Research; export trade statistics of individual Pacific island countries.

Opportunities for horticultural and other high value exports

New Zealand, Australia and the west coast of the United States have large and increasing Pacific island and Asian populations that offer a significant market for a range of horticultural products, including root crops. Fiji and the Polynesian countries are best placed to take advantage of these opportunities. In the case of Fiji, smallholder horticulture is now the fastest growing sector in an otherwise stagnant economy. Natures Way Cooperative (Fiji) Ltd has grown from a small business quarantine-treating 30 tonnes of papaya in 1996 to an agribusiness handling around 1,200 tonnes of fruit (papaya, mango, eggplant and breadfruit) annually for export (Figure 3). The enterprise has stated that a five-fold increase in these exports is feasible without saturating the market (Natures Way Cooperative 2001). Despite this encouraging trend in Fiji's fresh produce exports, there has been significant under performance due to phytosanitary market access issues.

Papua New Guinea, Solomon Islands and Timor Leste are largely excluded from international markets due to limited airfreight capacity, unfavourable fruit fly status, and the absence of their own people living in target markets. While western Melanesian countries generally do not have a comparative advantage in producing horticultural products for export, indigenous tree nuts and orchids are important exceptions.

Pacific island countries' capability to export horticultural and other high-value agricultural products

Horticultural products

The five main factors that determine an island country's capability to export horticultural products successfully are identified as

- suitable agronomic conditions to produce products with identified markets and ready access to an international airport or seaport
- the availability of air and sea freight capacity to target markets at reasonably competitive freight rates
- private sector marketing capability
- quarantine pest status and management, particularly fruits flies
- ability to resolve phytosanitary and other market access issues.

A summary evaluation of these factors for selected Pacific island countries is presented in Table 2. Each factor was rated on a 1 to 10 scale, with additional points for benefits accruing to the country from resolving market access issues. This analysis is inevitably subjective. It is based on the author's experience in working with the agricultural sectors of Pacific island countries, particularly on market access issues. The analysis provides a systematic framework within which opportunities, constraints and requirements to expand markets can be considered. Indexes measuring aggregate market access opportunities and capability to take advantage of these opportunities (from a possible score of 60) are summarised in Table 3 for each country.

Fiji rated significantly higher (40) than all other Pacific island countries for market access opportunities and capability. However, to achieve its potential Fiji must substantially enhance its ability to resolve market access issues. Vanuatu and Samoa are assessed to have approximately the same market access opportunities and capability (31 and 30 respectively). In common with all Pacific island countries, both countries are weak in their ability to negotiate market access and to resolve access issues. In addition, the marketing capability of Vanuatu and Samoa's private sector needs strengthening. Tonga and the Cook Islands rank somewhat lower (28 and 27.5 respectively) as they have less suitable agronomic conditions and less ready access to an international airport and ports compared to Vanuatu and Samoa. In Tonga,

Table 2 **Aggregate indices of market access opportunities and capability for selected Pacific island countries**

	Score
Fiji	40
Vanuatu	31
Samoa	30
Tonga	28
Cook Islands	27.5
Papua New Guinea	24
Solomon Islands	14.5
Kiribati and atoll countries and locations	8

Source: Author's calculations.

government involvement in quarantine treatment operations has constrained fresh produce export development.

Papua New Guinea scored 24 for market access opportunities and capability. Although it has outstanding agronomic conditions in some highland locations, its score was adversely affected by poor physical infrastructure and a most unfavourable fruit fly status for exporting fruit and vegetables. However, Papua New Guinea has the advantage of a relatively strong private sector. The Solomon Islands has similar opportunities and constraints as those faced by Papua New Guinea. Its much lower ranking (14.5) was primarily due to a weaker private sector. The atoll countries scored only 8 as they offer little or no prospect for fresh produce exports.

Spice products

Transportation and phytosanitary issues, the key determinants of success in horticultural exports, are far less important for the export of spice products. Here, success is based on three key factors

- suitable agronomic conditions to produce products with identified markets
- private sector marketing capability
- ability to resolve market access issues, particularly those relating to food safety certification.

The experience of vanilla in Papua New Guinea shows that Melanesian countries can be highly successful in exporting spice products. A FAO study highlights this unprecedented development.

> In 1998 there were no official exports of vanilla from Papua New Guinea. In 2003, 101 tonnes were officially exported, with an estimated value of US$35 million. This represented about 11 per cent of Papua New Guinea's agricultural exports in that year, and 10 per cent of world vanilla production. It is possible, depending on the level of Indonesian production in 2004, that Papua New Guinea could become the second largest producer in the world. Papua New Guinea has become a major player in the world vanilla market. This is an unprecedented situation for any Pacific island country. Even the relatively large PNG coffee and cocoa industries produce only some 1 per cent of global production (McGregor 2004:i).

The most obvious reason for the PNG vanilla phenomenon was the high prices offered from 2003 to mid 2004. The PNG grower price increased 1,300 per cent over a two-year period ending December 2003. Similar price increases were on offer to vanilla farmers worldwide. Yet, nowhere else did the response match that of the semi-subsistence village farmers of the East Sepik. Agro-ecological conditions in parts of this province proved ideal for vanilla production. Vanilla's high unit value and non-perishability when cured make it particularly attractive to remote locations with poor or non-existent road access. Phytosanitary issues do not pose a market access constraint for spices as they do for horticultural products. However, satisfying the food safety certification requirements of importing countries is increasingly likely to be a major barrier to entry.

Phytosanitary market access constraints to Pacific island country fresh produce exports

Quarantine is a mandatory responsibility of government and has been identified as the weak link in the Pacific island country horticultural export marketing chain. To prosper, the agricultural sector requires

Table 3 **A summary evaluation of factors determining the opportunities and capability of Pacific island countries to export horticultural products**

	Suitable agronomic conditions to produce products with identified markets and ready access to an international airport or seaport	**Sufficient freight capacity**	**Private sector marketing capability**	**Quarantine pest status and management, in particular, fruit flies**	**Ability to negotiate market access and to resolve market access issues**	**Benefits derived from resolving market access issues**
Fiji Total index=40	Areas in the intermediate climate zone with access to irrigation offer excellent conditions for horticultural products such as papaya. These areas are located in close proximity to the international airport in Nadi and the international sea port at Lautoka. Taro growing areas in Eastern Viti Levu and Taveuni have access to the international port in Suva. Other areas of Fiji will not develop horticultural exports without access to an international sea port and/or international airport. Overall assessment: excellent for parts of Viti Levu (9); fair for parts of other major islands (4); poor elsewhere (2). Weighted average = 7	The number of weekly wide-body (container carrying capacity) flights from Nadi are currently (April 2007) • Sydney (9) • Melbourne (4) • Auckland (14) • Los Angeles(4) • Tokyo (3) There are approx. weekly voyages from Lautoka and Suva to New Zealand and Australia, and fortnightly voyages to US west coast ports. Overall assessment: excellent (8)	The success of the horticulture export sector can be largely attributed to the skill and resilience of the Fiji produce exporters. Fiji's competitive marketing system contrasts with the situation in other Pacific island countries, where the absence of middlemen is identified as a major weakness in the marketing chain of root crops. Overall assessment: good to excellent (8)	Fiji has two fruit flies of economic significance (of quarantine importance but not of production importance). A long standing commercial quarantine treatment business is in place. Some BQAs are also in place. Quarantine issues constrain taro exports. There are excellent opportunities to increase the number of BQAs. Overall assessment: good (7)	Fiji quarantine (FQIS) had a high level of capability up until 1998, but it has been ineffective since. Overall assessment: weak (2)	Readily available markets currently restricted by access constraints: - New Zealand (gourds, jak fruit, guava, wi, melons, orchids, expanded taro with improved protocol) - Australia (breadfruit, egg plant, wi, chilli, ginger, taro with improved protocol) - US (breadfruit, papaya) - Japan (ginger) Overall assessment: considerable (8)

Vanuatu Total index=31	Excellent growing conditions for horticultural products on Efate and Santo. Moderately sized international airport on Efate with reasonable access. International sea ports on Efate and Santo with reasonable access. Overall assessment: good for Efate (8), reasonable for Santo (4) and poor elsewhere (2). Weighed average = 6	Frequent direct air links with Australia, with some container carrying capacity. Some flights to Auckland (not wide body). Reasonably frequent shipping to NZ and Australia from Efate and Santo. Overall assessment: reasonably good airfreight and sea freight to Australia (6)	Private sector operated quarantine treatment facility. Shortage of middlemen identified as a constraint. Overall assessment: reasonable (5)	Vanuatu has two fruit flies of economic significance, one of which has a wide host range. A quarantine treatment facility is owned and operated by a private business. Some BQAs are in place. Quarantine issues constrain ginger exports. There are good opportunities to increase the number of BQAs. Overall assessment: fair to good (6)	High level of capability until 1998, but ineffective since. Overall assessment: weak (2)	Readily available markets restricted by access constraints - New Zealand (limes, chillies and melons) - Australia (ginger, taro with improved protocol) - EU (indigenous nuts) Overall assessment: good (6)
Samoa Total index=30	Samoa's volcanic soils are highly fertile and free draining. These areas are well suited to growing fruit crops such as papaya, rambutan, citrus and breadfruit. However, larger-scale, mechanised production is difficult due to rocky areas/ outcrops. Upolu growers have good access to an international airport and sea port. Access not as good for Savaii producers – although there is a daily ferry service. Overall assessment: good for Upolu (8) and fair for Savaii producers (4). Weighted average = 6	Regular flights from Upolu to NZ with some container carrying capacity. Limited direct flights to Australia; a few flights to the US. Reasonably frequent shipping to NZ, Australia and the US west coast ports. Overall assessment: reasonable for airfreight to NZ (5); good for sea freight (7). Weighted average = 6	Samoa's substantial taro exports in the past were driven by the private sector. The involvement of the government-owned Ag. Store has been a negative influence on market development Overall assessment: reasonable (5).	Samoa has two fruit flies of economic significance; neither are particularly damaging. A small semi-commercial quarantine treatment facility is operated by the government. Some BQAs have been negotiated, but there are good opportunities to increase their number. Overall assessment: reasonable (5)	Has not been particularly effective. Overall assessment: weak (2)	Readily available markets restricted by access constraints - New Zealand (limes, wi, rambutan, chillies and melons) - Australia (breadfruit, vi) - US (breadfruit) - Europe (noni juice) Overall assessment: good (6)
Cook Islands Total index=27.5	Parts of Rarotonga good, outer-island atolls poor. Rarotonga growers have good access to a moderately-sized international airport and a sea port. Very poor access for the outer islands. Overall assessment: good for Rarotonga (8) and very poor for the outer islands (1) Weighted average = 5	Regular flights from Rarotonga to NZ with some container carrying capacity. Reasonably frequent shipping to NZ. Overall assessment: reasonable for airfreight to NZ (5); reasonably good for sea freight (6). Weighted average = 5.5	Cook Islands papaya and noni exports are driven by the private sector. Overall assessment: reasonable (5)	Cook Islands has two fruit flies of economic significance with a wide host range. It has the first commercial quarantine treatment facility established in the region. Some BQAs are in place, but opportunities exist to increase their number Overall assessment: reasonably good (6)	High level of capability until 1998 but has been ineffective since. Overall assessment: weak (2)	Readily available markets restricted by access constraints - New Zealand (chillies and melons) - Europe (noni juice) Overall assessment: modest (4).

Tonga Total index=28	The relatively temperate conditions on Tongatapu provide good conditions for horticultural products. Soils are reasonable. The shortage of water for irrigation poses a major constraint. Tongatapu producers have good access to a moderately sized international airport and sea port. Overall assessment: good for Tongatapu (8) and poor elsewhere (2). Weighted average = 5	Regular flights from Nuku'alofa to NZ with limited container carrying capacity. No direct flights to Australia; a few flights to US. Reasonably frequent shipping to NZ, Aust. and US west coast ports. Overall assessment: limited for airfreight (2); reasonably good for sea freight (6). Weighted average = 4	The performance of the Tongan vanilla and squash export industries indicate a strong private sector marketing capability. Overall assessment: good (7).	Tonga has three fruit fly species of economic significance. One of these is a particularly damaging fruit fly with a wide host range. A quarantine treatment facility owned and operated by govt is in place (performance poor). Some BQAs have been negotiated, and there are good opportunities to increase their number. Overall assessment: fair to reasonable (5)	High level of capability up until 1998 but has not been effective since. Overall assessment: weak (2).	Available markets restricted by access constraints - New Zealand (melons, chillies, vi, bananas with improved protocol) Overall assessment: reasonable (5).
Papua New Guinea **Total index=24**	The Highlands of Papua New Guinea provide ideal conditions for growing temperate horticulture and floriculture products. These are almost identical conditions to those found in the Highlands of Kenya, which is amongst the world's leading horticultural export regions. Other lowland locations are also suitable for horticultural production. Overall assessment: exceptional for some Highland locations (9). Virtually all Papua New Guinea's agricultural production areas are not in economic proximity to an international airport. The potential horticultural production areas in the Highlands are particularly isolated from viable access to international markets. Overall assessment: ranges from fair to poor due to market access constraints. Weighted average = 3	No direct air links to NZ. Daily flights to Aust. from Port Moresby with very limited container carrying capacity. Reasonable sea freight links to Australian, NZ, Asian and European markets from Port Moresby and Lae. Overall assessment: poor for airfreight (1); good for sea freight (7). Weighted average = 4	Papua New Guinea has a capable private sector that could take advantage of produce export opportunities if they were available. Papua New Guinea's large commodity export sector is led by a dynamic private sector. The largest cocoa exporter became a major exporter of vanilla. Private shippers have led the development of significant produce shipments from the Highlands to Port Moresby. Overall assessment: excellent (8)	A most unfavourable fruit fly status. The largest number (12) of economically important fruit flies in the Asia-Pacific. No quarantine treatment facility is in place and no non-host protocols have been negotiated. Overall assessment: poor (2)	NAQIA not seen to be effective in negotiating BQAs. Overall assessment: weak (2)	Available markets restricted by access constraints - New Zealand (pineapples) - EU (indigenous nuts) Overall assessment: could be considerable, particularly for products such as indigenous nuts (5)

Solomon Islands Total index=14.5	Excellent growing conditions can be found on the Guadalcanal plains and parts of Malaita. Honiara is served by a small international airport and sea port. An international sea port is at Munda in Western Province. Overall assessment: Reasonable for Guadalcanal plains (6), poor elsewhere (1) Weighted average = 4	Limited air links to Brisbane with no container capacity. Reasonably frequent shipping to Australia. Overall assessment: air freight capacity poor (1); reasonable sea freight to Australia (4). Weighted average = 2.5	Private commodity exporters in place and a small trading sector. Overall assessment: limited (3)	The Solomon Islands has a similarly unfavourable fruit fly status to Papua New Guinea. It has no quarantine treatment facility and no non-host protocols negotiated. Overall assessment: poor (2)	No current capability. Overall assessment: very weak (1) Generally poor capability. However, Tuvalu did secure a BQA with New Zealand to export whole coconuts. This was suspended in early 2007 with the discovery of ants in a shipment.	Readily available markets restricted by access constraints - EU (indigenous nuts) Overall assessment: limited (2)
Kiribati and other atoll countries and locations Total index=8	The conditions on Kiribati and other atolls are unsuitable for growing other commercial agricultural products. Tarawa is served by a very small international airport and a small sea port. Overall assessment: poor (1)	No air freight capacity and limited sea freight capacity. Overall assessment: poor (1)	Virtually no private sector capability. Overall assessment: very limited (2)	At least one fruit fly of economic significance. Overall assessment: very limited (2)	Overall assessment: very weak (1)	Overall assessment: not a factor (1)

timely export protocol development. Even Fiji, the most successful exporter of horticultural products, is making agonisingly slow progress in meeting quarantine requirements, as illustrated by papaya. Fiji was a significant exporter of papaya to Australia until the early 1990s, but these ceased in 1992 with the loss of the chemical fumigant ethyl dibromide (EDB) as a quarantine treatment. Fiji responded quickly by acquiring the non-chemical quarantine treatment technology, high temperature forced air (HTFA). New Zealand approved this treatment for papaya from Fiji in 1995, with exports recommencing in 1996. However, it took a further six years before papaya was given access to Australia. In 2006, Fiji exported around 400 tonnes of HTFA-treated papaya to Australia. Industry projections are for these exports to exceed 1,000 tonnes over the next five years (pers. com., Sant Kumar, Chairman, Fiji Fruit and Vegetable Industry Council).

There are opportunities to ameliorate a significant number of the phytosanitary constraints that adversely affect Pacific island country export trade. Examples with respect to taro, fresh fruit, and root ginger are discussed briefly below.

Taro

The value of taro exports from the Pacific island countries is approximately A$13 million annually. New Zealand is the main market and the Samoan communities in New Zealand, Australia and the United States are the main buyers. Until 1994, Samoa dominated these exports. Fiji replaced Samoa as the dominant supplier when the Samoan industry was decimated by taro leaf blight (*Phytophthora colocasiae)*. Taro is now Fiji's second largest agricultural export industry after sugar. Exports go to New Zealand (6,400 tonnes in 2005, f.o.b. value F$10.7 million), Australia (2,100 tonnes in 2005, f.o.b. value F$4.7 million) and the United States (1,400 tonnes in 2005, f.o.b. value F$3.6 million). These export revenues provide a livelihood for some 20,000 rural households, located mainly on the islands of Taveuni and Koro and in the interior of Viti Levu. Small quantities of taro are also exported from Samoa, Niue, Cook Islands and Vanuatu. Exports from Samoa are expected to grow steadily given that blight resistant varieties, with acceptable eating qualities, are now available.

New Zealand, Australia, and the west coast of the US have large and growing Pacific Islander populations. According to New Zealand's last population census, the Pacific Islander population numbered 213,000 (6 per cent of the total). The combined Pacific Islander population of New Zealand, Australia, and the United States exceeds 500,000. Per capita consumption of taro amongst Pacific islanders living in these countries is only around 20 kilograms per annum; a fraction of the consumption levels in Samoa and even Fiji. If taro consumption was doubled, per capita consumption would still be less than 1 kilogram per week. A strong cultural preference for the consumption of taro exists; however, there has been no market expansion over the past five years. The lack of growth in taro consumption can be explained by the relatively low incomes of Pacific islanders as a group, the exceptionally high price of taro relative to other starch sources (potatoes, rice, and wheat flour), and the generally poor quality of the taro available. The strict phytosanitary requirements of the importing countries are major contributing factors to this lack of competitiveness.

New Zealand's fumigation requirements and legislation. New Zealand's environmental protection legislation is aimed at curbing the inflow of invasive plant and animal species. Under this legislation the importation of any live insect species is prohibited. Over recent years, this

legislation has been strictly enforced. The discovery of a live insect on a consignment means mandatory fumigation with methyl bromide.

In late 2001, the New Zealand Ministry of Agriculture and Fisheries discovered mites on taro from Fiji. As a consequence, over the next two years 70–80 per cent of taro consignments from the Pacific required fumigation. Following a request from Fiji, the Auckland-based Pacific Islands Trade and Investment Commission (PITIC) and Secretariat of the Pacific Community (SPC) sponsored a comprehensive pest risk assessment of mites on taro from the Pacific island countries. In June 2003, a report by Landcare Research NZ Ltd. concluded that it was highly unlikely the tropical taro mite (*Rhizoglyphus minutes*) could survive in New Zealand. Furthermore, if it did survive, the probability of causing any damage to New Zealand's bulb crops was assessed to be extremely low (Zhi Qiang Zhang 2003).

More recently, New Zealand's quarantine focus on taro has shifted from mites to nematodes. The application of a more stringent inspection regime, utilising high-powered microscopes, resulted in the inevitable discovery of nematodes on taro. Microscopic nematodes reside in soil and will always be found on tubers and root crops. Mandatory fumigation follows if nematodes are discovered by quarantine inspectors. There is also a re-inspection after fumigation and if residual live nematodes are found, a second fumigation is undertaken.

Fumigation, together with the costs of insect identification, significantly increases exporting costs and the price to consumers. More importantly, fumigation substantially reduces the shelf life and marketability of the product, particularly if a second fumigation is undertaken.

New Zealand's environmental legislation requires fumigation in the presence of all nematodes. However, only parasitic nematodes should be of quarantine significance, because they feed off live plant tissue. Most nematode species are non-parasitic and thus harmless. The key issue is the type of nematodes that are being found on Pacific island country taro. An earlier FAO study identified three parasitic nematodes on taro in Fiji (Orton Williams 1980).[2] According to New Zealand nematologist, Dr Gordon Grandison, the root-knot and lesion nematodes will only survive under tropical conditions.[3] Dr Grandison believes that it is unlikely New Zealand Biosecurity officials are finding parasitic nematodes at border inspections.[4]

Saprophytic (non-parasitic) feeding nematodes are distinguishable from parasitic nematodes (under a microscope of sufficient power) by the absence of a 'buccal spear' used to 'attack' plant tissue. Dr Grandison recommends that MAF Biosecurity inspectors be trained to determine if a nematode is parasitic (potentially of quarantine significance) or non-parasitic (not of quarantine significance). The implication is that non-parasitic nematodes would be cleared immediately without further identification or fumigation.

The examples of tropical taro mite and nematodes on Pacific islands' taro demonstrate the importance of conducting basic taxonomic research to assist trade and biosecurity issues. As stated by New Zealand's Landcare Research (2004:12), the case of the taro mite shows that correct pest identification is the key to accessing correct information and vital for decision making. Small investments in basic research can lead to large benefits in Pacific island trade and economic development.

Physical quarantine treatment requirements for Pacific island country taro into Australia. For Pacific island country taro to be imported into Australia the top and bottom of the colm must be cut off and all

eyes (growing points) removed. The purpose of this robust physical quarantine treatment is to ensure that taro imported from Pacific island countries cannot be propagated and thus potentially lead to the establishment of taro leaf blight (*Phytophthora colocasiae)* in Australia, where there is no record of its presence. These measures result in product loss (10 to 15 per cent by weight), increased handling costs, and poorer quality. The significant reduction in shelf life means that Pacific island country taro is air freighted to Australia. Overall, there is substantial reduction in the competitiveness of Pacific island country taro on the Australian market compared with locally grown taro and other starch substitutes.

Fresh fruit

From 1994 to 1997, the Pacific island countries made considerable progress in developing BQAs for the export of fresh fruit products to New Zealand. These included

- Cook Islands—HTFA protocols for papaya and mango and non-host protocols for 'birds eye' chilli, smooth cayenne pineapples, and zucchini.
- Fiji—HTFA protocols for papaya, eggplant, mango and breadfruit and non-host protocols for certain varieties of chillies and smooth cayenne pineapples
- Tonga—HTFA protocols for papaya, tomatoes and eggplant
- Samoa—HTFA protocols for breadfruit and papaya and a non-host protocol for bananas (mature green)
- Vanuatu—HTFA protocols for eggplant, grapefruit and papaya and non-host protocols for squash, cucumber, and certain varieties of chillies and pineapples
- New Caledonia—HTFA protocols for mango, limes and capsicums.

Significantly, during this period New Zealand adopted a simple protocol that allowed for certain qualifying Pacific island country fruits and vegetables to be imported as non-fruit fly hosts. For such crops this avoids the complications and cost of HTFA treatment, which to date has only proven to be commercially viable for Fiji. The New Zealand non-host methodology is based on an experimental procedure[5] that does not require the prohibitive sampling of large quantities of fruit required by traditional statistically-based (probit 9) non-host methodologies used by other importing countries.[6] A number of BQAs were negotiated with New Zealand, based on its non-host protocol. These included the Cook Islands ('birds eye', smooth cayenne pineapples, and zucchini); Fiji (certain varieties of chillies and smooth cayenne pineapples); Vanuatu (squash, cucumber, certain varieties of chillies, and smooth cayenne pineapples); and Samoa (bananas—mature green).

The impetus for progress in market access from 1994 to 1997 was the technical assistance provided under the SPC's RFFMP. The Project worked with Pacific island country agriculture ministries to collect, analyse and submit data to the New Zealand MAF. It also played a critical role in assisting the Pacific island countries to follow up on their data submissions.

Regrettably, since the RFFMP ceased substantive operations in 1998, there have been no new protocols negotiated for the export of Pacific island country fruit and vegetables to New Zealand and Australia. Fiji was able to finalise a BQA for papaya exports to Australia in 2003, based on research data collected and submitted during the time of the RFFMP.

The Strategic Plan (2002–2006) of Fiji's quarantine treatment business (Natures Way Cooperative (Fiji) Ltd) identified the following new products and export markets

for fruit and vegetables as well suited to HTFA quarantine treatment

- New Zealand—gourds (bitter, bottle, and sponge), wi, jak fruit, passionfruit and Thailand guava
- Australia—eggplant and breadfruit
- United States—papaya and breadfruit.

The Strategic Plan identifies the markets for each of these products and makes export forecasts. It expected BQAs to be in place for all of these new products and markets by 2006, with an additional 300 tonnes of fruit being treated for export—which would have generated approximately F$1 million annually in income for exporters and farmers. However, none of these protocols have materialised despite the existence of proven and effective quarantine treatment technology, strong identified demand for the products, and exporters agitating for action.

The negotiation of a BQA for the export of fruit fly host products requires HTFA confirmatory tests to be undertaken and the data submitted to the quarantine authorities of the importing country, together with a current pest list. The submission of the required data is the responsibility of the quarantine service of the exporting country. The timely finalisation of a BQA requires on-going interaction between the quarantine services of the exporting country and the authorities of the importing country. However, since the technical assistance provided by the RFFMP ended, this process has stalled.

There has also been no new non-host BQAs with New Zealand, despite a number of strong candidates, including rambutans and colour break bananas from Samoa. Furthermore, it is regrettable that other importing countries are yet to adopt New Zealand's methodology for determining non-host status.

The slow progress in securing market access can be explained in part by importing countries giving a low priority to pest risk assessments of minor crops from small countries. However, much of the problem lies within the Pacific island countries themselves. Due to a lack of consultation with industry, quarantine services have been ineffective in determining market access priorities. Consequently, market access product priority lists presented to importing country authorities by Pacific island country quarantine departments can be out of line with market reality. Scarce pest risk assessment resources and negotiating capital can be squandered on products with little or no market potential at the expense of those with good potential.[7] By and large, Pacific island country quarantine services have not been sufficiently proactive and technically equipped to manage the process with their quarantine counterparts in importing countries.

The quarantine services in Papua New Guinea, Samoa, Solomon Islands and Vanuatu have all benefited from substantial aid-funded institutional strengthening projects. To capitalise on this institutional strengthening, specific investment into facilitating market access is required. Given the importance of scientific justification for phytosanitary measures, a successful quarantine service must have the necessary technical (particularly entomology and plant pathology) and management capabilities. Donor support needs to concentrate on these areas.

Fresh ginger

Fiji exports fresh ginger to the United States and New Zealand. Vanuatu has a BQA in place to export ginger to New Zealand. There are market opportunities for both countries to export fresh ginger into Japan and Australia, but they are excluded on quarantine grounds.

To export fresh ginger to Japan, the soil in which the ginger is grown has to be

certified free of the nematode, *Radopholus similis*. The same requirement would have to be met to export Japanese taro (sato-imo) to Japan. This nematode-free requirement creates both a constraint and an opportunity for Fiji and Vanuatu. Suitable ginger and taro growing locations have been identified that have not previously grown ginger and thus are likely to meet the *Radopholus*-free requirement. However, technical assistance will be required to obtain this nematode certification. Potentially, a market of several thousand tonnes exists.

In Australia there is a market for 300 to 400 tonnes of Pacific island country ginger if quarantine barriers can be overcome. A thorough risk assessment could conclude in favour of importation of ginger from Fiji or Vanuatu, particularly for immature ginger that does not face the same disease problems as mature ginger. This is suggested by factors such as

- Pacific island ginger could be sold in southern Australia, thousands of miles from the Australian ginger growing area
- Australia has a very unfavourable ginger disease status
- Fiji is permitted to export ginger to Hawaii, which is a major ginger producer.

Restricted access for niche products from the Pacific in the European Union

The Pacific island countries have a range of unique products that have considerable market potential. These include

- indigenous nuts from western Melanesia Galip/ngali/nangai/kaunigai (*Canarium*), cut-nut (*Barringtonia*), sea almond and okari (*Terminalia*)
- noni (*Morinda citrifolia*) a medicinal product. Noni is already a substantial export from French Polynesia (approx. A$15 million); Samoa (approx. A$5 million) and Cook Islands (approx. A$2 million)
- kava (*Piper methysticum*).

With the exception of kava, there is little or no restriction on the entry of these products into Pacific Rim markets. Pacific island exports of noni to the US now exceed US$15 million annually. Europe probably offers better market prospects for these types of unique products. However, exports of products such as indigenous nuts and noni juice are subject to the Novel Food Regulation (NFR), which requires that any new food item imported into the EU after 1997 be not deleterious to human heath. These regulations are a blanket response to the possibility of genetically modified (GM) products entering the market.

Food safety

Satisfying the food safety certification requirements of importing countries can prove to be a major barrier to entry for spice and essential oil products. It can be expected that Hazard Analysis and Critical Control Point (HACCP) food safety certification will also become increasingly important for fresh produce exports, in the same way it is standard practice for processed food. For example, since 2005 major US supermarket chains have insisted on food safety certification from their suppliers following e-coli (O157:H7) contamination from certain vegetable products.

Recommendations for a collaborative regional effort to facilitate agricultural market access

The discussion above identifies a range of phytosanitary and other market access constraints for Pacific island country non-commodity exports. The capacity of countries to deal with market access

issues needs to be substantially enhanced if agricultural exports from the region are to reach anywhere near their full potential. These are small countries with limited technical capability. Furthermore, most products seeking market access from the Pacific islands are of minor importance from the viewpoint of the importing countries. Thus they tend to be afforded low priority in the allocation of market access resources. A collaborative regional effort will be required to have a major impact. The RFFMP provides a model for such a collaborative regional initiative.

The RFFMP, under the umbrella of SPC, successfully harnessed the efforts of national research and quarantine departments to deal with the common problems created by fruit flies in the region. ACIAR and USDA/ARS collaborated in these efforts with funding coming from AusAID, NZAID, FAO and USAID. Through this coordinated regional effort over nearly a decade, there was a solid achievement in expanding exports by removing market access and production constraints. There were also significant food security benefits accruing from these collaborative efforts. An important secondary benefit was the strengthening of the research capability of the countries participating.

The RFFMP dealt with market access issues specific to fruit fly host products. What is now required is an expanded program covering phytosanitary and sanitary issues for all products, which ould also address food safety market access issues. Root crops, spices and livestock products would be included.

For example, under the management of SPC the collaborating research partners could include the national research institutions of the potential exporting countries, ACIAR, New Zealand's Landcare Research, the USDA's Pacific Basin Agricultural Research Center (PBARC)[8], the University of the South Pacific and the University of Hawaii. The quarantine services in the participating countries would also be important regulatory partners.

A unique feature of the proposed program would be that its coordinated efforts would be on both sides of the market access 'fence'—assisting the Pacific island countries to improve their market access submissions to importing countries, and facilitating the progress of these submissions by the importing country. Following the RFFMP model, the program would have three core functions: market access facilitation, advocacy, and applied research. Advice would be provided to industry and governments on what should be the priority products to which scarce market access resources should be devoted. Technical assistance in developing appropriate quarantine treatments would be made available for priority products where this was deemed necessary.

Expected benefits

High economic rate of returns can be expected from relatively modest interventions. The beneficiary horticultural industries are all labour-intensive, providing high levels of employment and value added. Improved market access offers the prospect of the Pacific islands being part of the horticultural revolution, with substantial growth and employment benefits accruing. For example, it is conservatively estimated that improving the quarantine procedures for taro (the most important Pacific island country fresh export product) would increase export earnings by some A$15 million annually and benefit at least 25,000 small farmers in at least three Pacific island countries.[9]

Notes

1 Ali (2006) notes that the horticultural returns to land are about ten-fold relative to cereals and generate considerable employment through production and off-farm employment, where the jobs in processing, packaging, and marketing are much more than in cereals. Women meet much of this increased demand for labour.

2 These were: root-knot nematode (Meloidogyne sp.); lesion nematode (Pratylenchus sp.); and burrowing nematode (*Radopholus similis*). There is only one recording of *Radopholus similis*, which came from a pot experiment (pers. comm., Dr Gordon Grandison).

3 Dr Grandison was formerly the head of the Entomology Division, Department of Scientific and Industrial Research, Auckland. He is the author of *Plant-parasitic Nematodes of American Samoa*, Grandison, G. S., Noumea, New Caledonia: South Pacific Commission, 1996 (Technical paper, South Pacific Commission, No. 205).

4 Grandison (pers. comm.) indicated that the interceptions are most likely to be

- Enchytraedae worms. These are not nematodes. They are 'large' worms that are only saprophytic-feeding (that is, feed on dead plant tissue, bacteria and fungi) and have no effect on plants. Thus they have no quarantine significance.
- Rhabditids nematodes and other saprophytic-feeding nematodes. This large group of nematodes are not parasitic and thus are harmless to plants.

5 The New Zealand non-host methodology is a two-stage procedure, involving stringent laboratory and field trials to confirm host status.

6 The probit 9 standard (99.9968 per cent) requires no more than 32 insects from one million pieces of fruit sampled.

7 An example is eggplant. Having observed the success of Fiji in exporting eggplant, Samoa and Vanuatu have placed this fruit fly host product at the top of their list. However, Fiji's success is linked to specific varieties sold to the expatriate indo-Fijian communities in New Zealand and potentially Australia. Without these linkages it is unlikely that other countries could emulate this success. For Samoa, vi apple (*Spondias dulcis*) would have been a much more sensible product upon which to concentrate scarce market access resources—vi apples grow abundantly in Samoa and are not available in New Zealand and would have a ready market amongst the Samoan community and other Pacific islanders. For Vanuatu, obtaining market access for root ginger into Australia would be a more sensible priority upon which to focus resources—the islands of Santo and Malekula offer excellent growing conditions and there is direct shipping from Santo to Melbourne where there is a market for ginger.

8 The Hawaii based PBARC were partners in RFFMP and were responsible for the successful transfer of non-chemical quarantine treatment technology that is now utilised by exporters of fruit fly host products from Fiji, Samoa and Vanuatu. PBARC is undertaking quarantine treatment work that is relevant for taro, a product facing significant market access constraints.

9 This estimate is based on the expectation that the low taro consumption could be doubled if prices can be significantly reduced and quality improved.

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