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Economic Prospects for Vanilla in the South Pacific

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Foreword

ACIAR's interest in vanilla production arose during the project entitled 'The Development of Smallholder Farming Systems in the Kingdom of Tonga'. Vanilla was noted as a promising crop for Tonga, being suitable for cultivation by smallholders and having a ready world market. The possibility of repeating this success with vanilla, or with other crops, in other countries is obviously of interest.

Information on the vanilla industry in the South Pacific has not been readily available, so this Report was prepared to fill this information gap. A key factor with respect to the continued success of vanilla is the future direction of the world market. An analysis of the factors underpinning this market and their effects on future world price changes allows a judgment to be made about the potential for future profitable production increases in the South Pacific. The Report also analyses the factors affecting the world market.

Vanilla also serves as a case study which facilitates the identification of other crops suitable for the South Pacific in terms of their production, processing and market characteristics.

As a follow-up activity ACIAR has commissioned a small study on the market prospects for oils and spices of relevance to the South Pacific. Should this study reveal promising lines of enquiry a more extensive study will be undertaken.

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Abstract

Vanilla is a crop that is generating interest among agricultural policy makers in South Pacific countries who are keen to encourage the production of speciality crops for which they can find a niche in export markets.

Vanilla fulfills many of the attributes needed of a speciality export crop. It is adaptable to edaphic conditions in many South Pacific countries, is relatively free of pests and diseases, and is quite easy for smallholders to grow. There are also associated value-adding processes in curing the vanilla beans, requiring relatively low capital investment and simple technologies. The crop is storable and fairly resistant to damage during transport and handling. Further, its value–weight ratio is high. Finally, there has been a healthy and stable world market for vanilla beans in recent years.

Introduction

Vanilla is the world's second most expensive spice by weight (after saffron). It is a product of vanilla beans, grown mainly in island countries of the developing world, but processed and consumed almost totally within the developed world. Artificial vanilla is usually made from lignite, the glue that holds wood fibres together, as a by-product of pulp and paper manufacture. It is substantially cheaper than natural vanilla and is produced in large industrial plants in North America and Europe. There is a dearth of recent economic information on the production and marketing of vanilla (a notable exception is Anand and Smith 1986).

The plant genus *Vanilla* is in the orchid family, but very few orchid species have fruits with an aromatic flavour. The most important two are *Vanilla fragrens* (also called *Vanilla planifolia)* which originated in Mexico, and *Vanilla tahitensis,* from Tahiti. The Tahitian species is regarded as producing a rather lower-quality aroma.

A unique production characteristic of vanilla is the requirement of hand pollination. In the plant's region of origin (Mexico) pollination is by bees. A practical method of hand pollination was not discovered until 1841, and that method is still in use today (Purseglove 1972).

Artificial vanilla holds about 95% of the total world vanilla market. Of the 5% of natural vanilla, approximately one-half is consumed in the United States. The primary use of vanilla is as an edible flavouring in industrially-produced items such as ice cream and in domestic cooking. The main flavouring ingredient is vanillin ($C_8H_8O_3$) which, as noted, can be manufactured artificially. The higher quality of real vanilla results from subsidiary substances in the vanilla bean. Free vanillin is not present in the beans at harvest, but is produced during curing by enzyme action on glucosides (Purseglove 1972).

World supply of vanilla is dominated by a cartel (Univanille) of the major producers—Madagascar, Réunion and the Comoros Islands. These three Indian Ocean nations supply approximately three-quarters of the world's vanilla. Of the three, Madagascar is the most important producer, having regained historical production levels after significant falls in 1979 and 1980. Prices of vanilla beans are currently around US$70/kg, and have been stable since 1980, principally due to the operations of Univanille.

South Pacific vanilla bean production is insignificant on the world scale. Production increases in Tonga (the major South Pacific producer) or elsewhere in the South Pacific are not likely to affect world prices. However, possible substantial increases in production by the Indian Ocean island countries is a potential impediment to the expansion of the vanilla industry in the South Pacific.

These issues, and the current status of the industry in the South Pacific, are explored in subsequent sections.

World Imports

The major market for vanilla is the United States, which traditionally imports approximately 850 t of dried vanilla beans per year (over one-half total world imports and approximately equal to the average annual production of the major producer, Madagascar). In the USA, most vanilla beans are processed commercially into essence by a handful of firms, prior to final consumption. On the other hand, in the two major European consuming countries, France and West Germany, the primary demand by households is for whole beans. The three major consuming countries, France, Germany and the USA, have been averaging over 80% of total world imports of 1550 t over the past 5 years (Table 1).

The variability in world import levels is thought to reflect changing supply/stockholding patterns rather than annual changes in consumption levels. The latter would be expected to be fairly constant, especially in the light of the relatively constant world prices prevailing in the 1980s (see later).

Consumption

There is little or no consumption or processing (extraction) of vanilla beans in producing countries. Thus, world trade figures could be used as a proxy for consumption levels. However, interpretation of these figures is obscured by the amount of reexporting of beans (e.g. from France) which occurs. World import levels are shown in Table 1. However, France and West Germany reexport substantial quantities of vanilla beans (around 200–300 t/annum). This total world import (Table 1) overestimates consumption by that amount. The large drop in world consumption in 1979 and 1980 was occasioned by rising prices which in turn were caused by supply shortages.

Industry sources put world consumption at about 1250 t in recent years, which is close to the average consumption level since 1980 calculated

Vanilla in Tonga.

Table 1. Imports of natural vanilla (tonnes of dried beans)

	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
USA	1014	1553	1185	497	343	640	884	977	841	743	1001	1387
West Germany	192	266	291	164	124	183	182	200	175	137	na	na
France	325	417	459	302	133	248	301	261	202	154	na	na
All other countries	370	585	465	398	344	386	308	349	317	260	na	na
Total world imports	1901	2821	2400	1361	944	1457	1675	1787	1535	1294	–	–

Source: Food Balance Sheet Tapes FAO, Rome, 1987

from Table 1. The importance of the USA in the world vanilla market appears greater on the basis of these consumption estimates, than on the basis of the import figures.

Artificial vanilla had taken 96% of the total USA vanilla market by 1985, but this share fell to 94% in 1986 (Valentine 1987). In other words, natural vanilla's share of the total market rose from 4 to 6%. Industry sources claim that there has been an average increase of approximately 10% in USA real vanilla consumption in recent years, although this is not revealed in the available statistics. This increase in real vanilla consumption is a consequence of greater high quality ice cream sales which rose by 30% in one year (cf 4% for all ice creams). Ice cream accounts for 44% of the natural vanilla used in the United States (Valentine 1987).

With the USA consuming one-half to two-thirds of the world's vanilla, and with ice cream accounting for approximately one-half of that USA consumption, developments in the United States ice cream market are clearly critical for natural vanilla demand. These effects are magnified by the USA market's leadership role in international ice cream consumption trends. The trend towards natural ice cream, using natural vanilla, appears to be worldwide. Despite the approximately ten-fold price differential between natural and artificial vanilla, this differential represents only a tiny proportion of the final retail price of ice cream (around 1%).

World Production/Exports

Vanilla production statistics are not readily available. Annual exports for the major producing countries are shown in Table 2. Madagascar's annual exports have typically been in the region of 1000 t, while the Comoros Islands exports about 200 t/annum. The smallest partner in the Univanille cartel is Réunion, which is a relatively insignificant exporter at around 20 t/annum. Production is sensitive to climate (for example major crop losses occurred as a result of cyclones in 1976). There have been consistent reports over the years of development schemes for the Madagascar vanilla industry but these have not been reflected in rising exports (Chadwick et al. 1961; Roberts 1980).

Indonesian exports were around 400 t in 1978, and reached that level again in 1986, but in intervening years they were around 100–200 t/annum. Indonesian beans are of a lower quality 'Java' type, typically trading at around a 20% or more price discount to the 'Bourbon' type produced by the Univanille countries. South Pacific countries (except Tahiti) produce the Bourbon-type bean.

Apart from Tonga, there are some minor producers in the South Pacific. These include Tahiti and Fiji. Production conditions are suitable for vanilla-growing in Vanuatu. Interestingly, Tahiti ranked with Madagascar as a dominant producer prior to 1930. Tahitian producers sub-sequently turned to plantation-style crops such as coffee and sugarcane, and vanilla production plummeted. A virus problem was also implicated in the demise of the Tahitian industry. The Fijian vanilla industry is in its infancy, with a production target of only 111 kg of cured beans in 1988(Ministry of Primary Industries 1988). However, growing interest in the crop, together with institutional support, is likely to lead to substantial growth in the industry in the next 4 years.

Table 2. Major vanilla-exporting countries (tonnes)

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Comoros	211	124	230	240	170	13	160	259	177	26	181	150
Madagascar	858	1101	1713	1469	437	410	713	1060	1099	826	710	940
Réunion	8	20	12	9	23	8	15	11	9	19	28	21
Indonesia	364	334	410	389	17	77	138	116	234	154	190	298
Total*	1441	1579	2365	2107	647	508	1026	1446	1519	1025	1109	1409

* Excludes minor producing countries and re-exports from nonproducing countries.
Source: FAO, USDA, various years

Madagascan and world production estimates from confidential industry sources are shown in Table 3a, although production figures are notoriously unreliable. The 1987 Madagascan crop was a record high, and stocks held in Madagascar are currently estimated to equal one year's world consumption. FAO production statistics are shown in Table 3b. The FAO figures are somewhat larger than the estimates of the vanilla industry.

Substantial crop damage in Madagascar occurred in a 1976 cyclone. To replenish USA stocks in 1977, and to a lesser extent in 1978, United States importers took large supplies from Madagascar in those 2 years. By 1979, Madagascan stocks and exports had declined to low levels. To encourage stock replenishment, prices paid to the 70 000 growers in Madagascar were raised over the period 1978–82 and this trend towards price rises is reported to have continued. In a similar vein, the small crop in 1986 in Madagascar (Table 3a) may have subsequently prompted buying by the USA (Table 1). Export taxes in Madagascar are high, with producers receiving about one-fifth of the world price (Anon 1987). A lowering of these taxes was partly responsible for the large crop in 1987.

There is a substantial potential for increase in Madagascan production if the government chooses to give a greater share of the export price to producers, rather than to take the revenue in taxes. Whether they will do this is a moot point. Yet the potential for increased production is clearly large given the gap between world and producer prices and the low Madagascan yields of 150 kg/ha indicated by an unpublished World Bank manuscript. The effect of a domestic price increase in Madagascar on production and, hence, world vanilla prices is unclear. It has generally been thought that the world demand for natural vanilla is somewhat inelastic (Chadwick et al. 1961). If this is the case, it will not be in Madagascar's interest to expand production.

Prices

Prices for vanilla beans rose gradually in nominal terms from about US$12 for 10 years following the formation of Univanille in 1968, roughly keeping pace with USA inflation. There was a five-fold increase in prices in 1979–80 as a result of low supplies from Madagascar, lending support to the notion of inelasticity in world demand. Subsequently, nominal prices have been stable at around US$70/kg (Table 4).

In real (compared with USA inflation) terms, prices in the 1980s have been approximately double those in the 1970s (excluding the abnormally high 1979 and 1980 prices). Price rises of this magnitude, while assisting the profitability of vanilla-growing substantially, carry with them the danger of attracting increased world production to the point where the additional supply would cause substantial reductions in prices.

Table 3a. Industry estimates of Madagascan and world vanilla production, 1980–87 ('000 t).

	1980	1981	1982	1983	1984	1985	1986	1987
Madagascar	0.8	1.0	1.2	0.5	1.3	1.6	0.6	1.7
World	1.3	1.5	1.7	1.0	1.8	2.1	1.1	n.a.
Total	2.1	2.5	2.9	1.5	3.1	3.7	1.7	n.a.

Source: unpublished vanilla industry estimates.

Table 3b. FAO estimates of Madagascan vanilla production, 1975–85 ('000 t)

1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
2.4	1.0	1.3	1.6	0.8	1.0	1.4	1.6	1.7	1.8	1.8	1.8

Source: FAO Food Balance Sheet Tapes 1987.

Implications of World Vanilla Market for South Pacific Producers

Tonga grows *Vanilla planifolia*, which is the same species as is grown in the major Indian Ocean island producer countries, whereas *Vanilla tahitensis* is grown in Tahiti. The general management and curing processes are now regarded as being of high standard although there have been some conflicting reports. In terms of type and quality, it appears that Tongan vanilla is similar to most of the vanilla traded on world markets, although this remains to be verified. Tahitian vanilla is of low quality.

The South Pacific is a relatively insignificant producer in the world vanilla market, producing approximately 0.5% of the total world figure, and hence is a price-taker in world markets. Tongan export statistics are shown in Table 5. South Pacific countries are not members of Univanille, but clearly they are able to profit from any price increases achieved by Univanille. Since Tongan-produced vanilla is of the Bourbon type grown by Univanille producers, Tongan vanilla is directly competitive on the major world markets. Indeed, this has been reflected in Tongan vanilla producers receiving a similar price to that received by Univanille producers.

Because of the general decline in the value of the Tongan currency relative to the US dollar, vanilla prices in Tongan dollars ($T) have risen more dramatically than prices in the USA since 1982 (Table 4). Any increases in production from Tonga alone will not cause a measurable drop in world vanilla prices. Major production increases in a number of South Pacific countries could be sufficient to cause a drop in world prices, but even if this does occur, vanilla production still appears to be a profitable activity (see later).

The world natural vanilla market is characterised by climatically induced supply variability and a relatively stable, but slowly expanding, demand. The cartel has successfully stabilised world prices since 1980 in the face of this situation. Stock levels in producing countries have historically equalled, or exceeded, one year's annual consumption. There is an indication that a low production year encourages stockholding in consumer countries. The poor production year in Madagascar in 1986 pushed stocks to relatively low levels, but the subsequent Madagascan crop is expected to be high. Historically, proposed expansions of the Madagascan industry have not occurred, and considerable scope exists to increase production by a lowering of high export taxes. However, if demand for natural vanilla is price-inelastic, such a policy will not increase economic returns to Madagascar. Thus, the rationale for increased price incentives to expand production in Madagascar is not strong.

Table 4. Vanilla beans: early March spot prices in New York

	US$/kg (nominal)	US$/kg (1980 prices)	T$/kg*
1970	12.2	25.9	10.9
1971	12.4	25.2	11.0
1972	12.4	24.4	10.4
1973	14.7	27.3	10.5
1974	15.1	25.2	10.5
1975	17.6	26.9	13.4
1976	20.3	29.4	16.6
1977	20.3	27.6	18.3
1978	22.9	28.9	20.1
1979	62.2	70.6	51.8
1980	132.0	132.0	115.8
1981	68.2	61.7	59.3
1982	61.6	52.5	60.4
1983	67.1	61.5	74.5
1984	68.7	54.5	78.1
1985	81.4	62.3	116.3
1986	78.1	58.6	116.5
1987	77.6	56.1	109.7
1988	77.0	n.a.	n.a.

Source: USDA, various years.

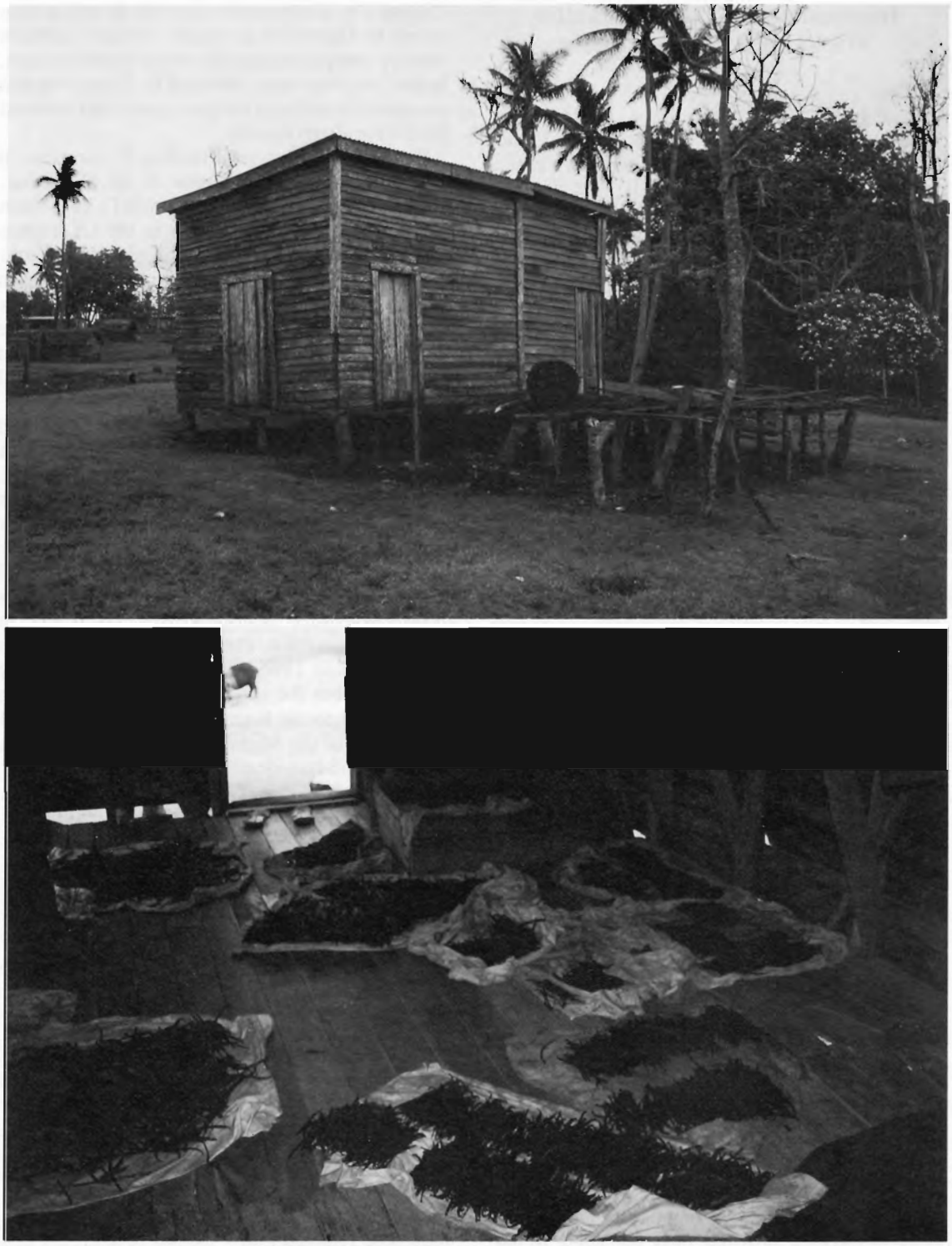
* Derived from previous column by converting at the nominal currency exchange rates prevailing in the particular year.

Vanilla in the South Pacific Agricultural Economy

There are five major criteria that can be used to assess the value of an export crop to smallholders in geographically dispersed countries such as the South Pacific islands. These are:

1. adaptability and ease of production, with an absence of any major pests and diseases;

2. simple value-adding processing activities requiring relatively low capital investment and simple technologies;



Exterior and interior views of a vanilla curing shed at Mataika, Tonga.

3. storability of the processed commodity, and resistance to damage during handling and transportation;

4. high value–weight ratio; and

5. sound world market prospects.

Vanilla admirably fulfills the first four mainly physical criteria and, as demonstrated above, the commodity has fetched high prices in a buoyant world market since 1979.

Ease of Production

The only substantial vanilla-producing country in the South Pacific is Tonga. As long as pests and disease outbreaks can be prevented, the maintenance of existing yields, and probably yield increases, should be within the capabilities of an increasing number of Tongan agricultural households in the future. A feature of vanilla is that it has proved relatively easy for semi-subsistence smallholders to grow in remote parts of islands and atolls. In the early 1980s, a Vanilla Development Project was implemented. The project was based primarily in the main vanilla-growing region of Vava'u.

The first major technical bulletin on Tongan vanilla cultivation consolidated the work of earlier French vanilla experts (Tiollier 1980), providing basic information on growing vanilla. He covered all aspects of the vanilla industry, from the establishment of new plantations to the harvesting and curing of the beans. Proper plantation management, especially in relation to shade, was regarded as critical in controlling diseases. Further papers have been prepared since Tiollier's work. In particular, Fa'anunu (1984, 1985) has modified and updated Tiollier's prescriptions. Fa'anunu has improved on previous levels of knowledge in two main respects: (1) he has added knowledge of the economic dimension of the production process, and (2) he has provided more specific information on production conditions in various parts of Tonga.

A feature of vanilla cultivation noted by a number of observers has been the ease with which it can be incorporated in the daily routines of members of semisubsistence agricultural households. Labour demands occur year-round, and the enterprise is generally considered to be labour-intensive (Roberts 1980; Schrambling 1986). However, labour intensity may or may not be a desirable attribute in the more remote regions of South Pacific countries such as Tonga. These regions have commonly experienced long periods of out-migration by many of the able-bodied male residents. A mitigating circumstance is the fact that the most labour-intensive activity is hand pollination; Tiollier (1980) regards it as also the most critical task for labourers to perform. This work is usually done by women in Vava'u and, hence, provides not only a cash-earning productive activity for women, but also an activity that is relatively undemanding of scarce male labour in outlying islands.

Processing

An important value-adding process of the vanilla industry that is undertaken in Tonga is curing the vanilla beans. Both Tiollier (1980) and Fa'anunu (1984, 1985) dealt with this process briefly. The major work in the area has been carried out by Tiollier (1983). He outlines the process which has the desirable attribute of being a suitable village industry for rural households.

The curing method Tiollier described is based on what has been called the 'Madagascar method,' appropriately modified to suit Tongan conditions. This method relies on simple technologies. Three alternative organisations are described. First, individual producers with reasonably sized vanilla plantations can do their own curing. Second, a group of individual producers can form a cooperative curing venture. The main attraction of this approach is the ability to share the costs of the major capital item—the curing shed. A few

Table 5. Vanilla exports from Tonga (tonnes of dried bean)

1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
1.2	4.1	10.8	8.2	1.9	5.0	4.8	11.6	8.8	13.2	4.1	18.0	11.6

Source: Tongan Department of Statistics (modified by the authors)

cooperatives have been established recently in Vava'u with the express purpose of buying and curing green beans, then selling the dried beans to the Tongan Commodities Board (T. Tapavalu, pers. comm. 1987). The above two processing modes are decentralised in that they are based in villages and run by villagers. The third alternative is a centralised process whereby a curing system is established to cover a whole district or region. Roberts (1980) has provided a good summary of the arguments for and against a centralised curing system.

The curing process consists of two phases: primary and secondary. The primary phase is more critical for ensuring the output of high-quality dried beans. The primary curing phase begins directly after harvesting. It involves cooking, sweating and sun-drying the green beans. Timely harvesting is essential for quality control in this phase. Tongan producers have been criticised by processors of vanilla essence in the past for harvesting beans before they are ready for curing (Freedman 1985). Despite the critical nature of the primary phase, equipment requirements are quite modest. As with production, basic management and the reliable performance of tasks by labour are the key factors ensuring that beans enter the secondary curing phase in good condition.

The secondary curing phase entails a slow-drying, sorting, grading and maturing of the beans. It is the more capital-intensive phase in that a curing shed is required under existing technologies. There may be a good opportunity for the innovation of less capital-intensive technologies in this phase. As indicated above, shed costs can be reduced by sharing the facility. Considerable effort has gone into the production of good-quality beans to enhance Tonga's reputation as a vanilla-producing nation. Notwithstanding the criticism made above of harvesting immature beans, Roberts (1980) reported that Tongan dried beans are generally of a high quality. About 85% are classified as A grade, 12% as B grade, and 3% are rejected.

Storability

After 2 months in maturing boxes, the vanilla beans stabilise and are ready for export. They can be stored for months, even years, without any marked deterioration of quality. Shipment of dried beans from Tonga is either by air (principally to the USA) or sea (mainly for Australian-bound beans). Air shipment is in tightly packed cartons of 10–12 kg. If the cartons are well-built and the beans are properly packed, damage during handling and air transport is minimal (Tiollier 1980). Because of the additional freight time and stress, the use of tin boxes in wooden crates is recommended for packing vanilla for sea transport.

Value–Weight Ratio

Compared with other major South Pacific export commodities, vanilla has a very high value–weight ratio. The weight of cured beans is about 20% that of green beans (Fa'anunu 1980). Because most curing is undertaken in the village (the decentralised system), cured beans are usually transported. Given the general transport difficulties from the more remote areas, the high value–weight ratio of vanilla beans enables marketing agents to economise on transport costs. Relatively low transport costs give the vanilla industry a decided comparative advantage in marketing from remote districts.

Average prices per kilogram in 1986 of major agricultural exports from Tonga (MAFF Planning Unit pers. comm.) are shown below. All are export fob prices, except for taro which is the fresh produce market price.

Vanilla	T$93.93/kg
Taro	T$ 0.88/kg
Coconut oil	T$ 0.45/kg
Bananas	T$ 0.37/kg

The differences are immense. The high value–weight ratio for vanilla is reflected by the fact that export by air to the United States is possible. Results of a 1980 economic analysis of vanilla production in Tonga are summarised and reviewed below, and some modifications and updating of the analysis are made. It is of interest to consider the effects of future world price decline on the profitability of vanilla production in Tonga. In the following section, estimates of the profitability of smallholder vanilla production are reviewed and used as a basis for analysing the sensitivity of profit to declines in the price of vanilla beans.

Economic Analysis of Tongan Vanilla Production

Previous Estimation of Grower Profitability

Estimates were made of net returns per acre over the typical life of a Tongan vanilla plantation and based on a number of assumptions about the nature of vanilla production in Tonga (Fa'anunu 1985). Most of these assumptions are uncontroversial. They concern such matters as plantation life, fruiting cycle, variable input costs of production and curing, plant density and capital costs. The two most critical assumptions are about expected yields over the life of the project and export prices. Price estimates were based on prevailing payout prices offered by the Tongan Commodities Board in 1985. These prices have altered little since that time.

Fa'anunu (1985) assumed that the first yields would be achieved in year 4; the producer can expect negative returns for the first 4 years totalling T$5798/ha. Yields are expected to rise to a maximum of 750 kg/ha in year 8. Maximum net returns of T$43360/ha are achieved in the same year. Total net returns to the producer over the life of the plantation were estimated at T$54212, or T$4216/year. From these results, he estimated a break-even price of dried beans of T$10.34/kg. He deduced from these results that prices would have to fall drastically from present levels for vanilla producers to incur a loss. However, there are two deficiencies in Fa'anunu's (1985) analysis. The first is his treatment of the value of money over time. Second, underlying the analysis is a presumption that the land will either be used for vanilla production or left idle, foregoing the opportunity to use the land for other purposes. His analysis is now amended to correct for these factors.

Discount Rate

The findings of Fa'anunu (1985) are valid only if a zero discount rate is assumed (i.e. each dollar of net returns has the same value regardless of the year in which it was earned). This assumption is hardly realistic, and hence we have reestimated net returns in present value terms. For this purpose, real discount rates of 5 and 10% have been used.

Incremental Profit

The real decision facing the producer is not simply whether or not to grow vanilla; it is a choice between growing vanilla or the next most profitable alternative cash crop (ignoring the possibility of mixed cropping). At present, the major alternative cash crop for producers in remote areas is copra. In estimating the economic attractiveness of vanilla, it would be more realistic to subtract the net returns in copra production from the net returns from vanilla production. On the other hand, only family labour requirements additional to those for copra production are directly taken up in the financial analysis of vanilla production. All of Fa'anunu's (1985) revenue and cost estimates are retained, as there have been no changes since his study to warrant modifications. However, following Gittinger (1982) family labour and land are implicitly taken into account in the returns to copra production.

Revised Profitability Estimates

The revised estimates of the profitability to growers of vanilla production are presented in Table 6. Sensitivity analysis was carried out to determine the impact on profitability of a decline in vanilla bean prices. (Prices were reduced to 50% of their current levels.)

The MAFF Planning Unit (1982) calculated the average number of nuts from coconut palms in Vava'u to be 13.8 and the average density of palms to be 40.36/acre (100.9/ha). This gives a yield of 557 nuts/acre (or 1392 nuts/ha). Five thousand nuts are needed to produce 1 t of copra (Coconut Review Committee 1982), giving a copra yield of 0.28 t/ha. This is low relative to other countries, and it is felt that improved yields could be achieved through better management of plantations, perhaps akin to the standards expected for vanilla. Copra yields of 0.6 t/ha are attainable under good management (Dutta Roy 1980).

Other data required for a comparison with copra included copra prices, labour-days and cash costs. Copra prices were taken from the latest World Bank (1986) long-term forecasts. These CIF prices ex Northwest Europe were adjusted to producer price equivalents by using a factor estimated by Hardaker and Fleming (1987). From preliminary unpublished results of recent

farm-level data collection, it was determined that annual labour requirements are about 30 labour-days/ha, with T$30/ha annual cash costs.

These results demonstrate the superior profitability of vanilla over what is usually the most common of alternative cash crops for producers in remote regions. Even with prices at half their current levels, and using a discount rate of 10%, the internal rate of return to vanilla production is around 45%. Hence, despite some methodological shortcomings, Fa'anunu's analysis provides results consistent with those obtained in this study.

Other cash crops currently grown in Tonga might be more profitable than copra. However, in remote regions with tiny local markets, many of these alternative crops do not satisfy all the four physical criteria (in addition to economic prospects) nearly as well as vanilla. Production processes might be more complex, with a heavy reliance on extension advice and purchased inputs (e.g. vegetables). Processing activities might be more capital-intensive and less suitable to village applications (e.g. oil palm). The output might be perishable and not easily handled and transported (e.g. root crops and bananas). Or, the value–weight ratio might be low, making transportation formidably expensive (e.g. just about every other alternative crop to vanilla except pulses and spices).

Two features of the results reported in Table 6 are their quite robust nature and the relatively slight difference between profits depending on whether high or low management inputs are used in the alternative copra enterprise. Producers should still make healthy profits by switching from copra to vanilla production even after taking into account time preference for money and the possibility of significantly lower vanilla prices. Even with vanilla prices at half their existing levels, a producer could expect to make about T$9000 more (in present value terms) over the 13-year life of the vanilla plantation than could be achieved by continuing to produce copra.

Fa'anunu (1984, 1985) and Tiollier (1980, 1983) have stressed that, while vanilla production and curing are relatively straightforward processes, regular attention to the plantation and reliable labour are essential to ensure high yields of beans. A contrasting feature of copra production at currently (and future) depressed prices is the relatively slight difference in returns between high and low management inputs. This attribute in respect to copra is reflected in the results given in Table 5. A copra plantation with low management inputs is likely to be almost as profitable as one with high management inputs.

Copra provides the limiting case, in that it is probably the least profitable alternative cash crop which nevertheless satisfies the needs of producers in remote areas. There is scope to explore other

Table 6. Relative profitability of vanilla growing with different discount rates, vanilla prices and copra management inputs (T$).

	Discount Rate		
	0%	5%	10%
Low copra management inputs and current vanilla price	54 364	35 997	24 290
High copra management inputs and current vanilla price	54 134	35 415	23 874
Low copra management inputs and vanilla price reduced to 50% current level	21 684	13 989	9 115
High copra management inputs and vanilla price reduced to 50% current level	20 855	13 424	8 708

* Defined as the net present value of a hectare of vanilla growing over a 13-year period after deducting returns to copra production as the next best alternative use of household labour and land.

Source: modified version of Fa'anunu (1985).

alternative crops to vanilla which possess that crop's favourable production and marketing attributes. The possibilities of intercropping and multistorey cropping, including vanilla, also warrant further investigation.

Some Policy Issues on the Introduction of Speciality Export Crops

A feature of the agricultural development planning processes of South Pacific island countries in recent years has been the attempts to diversify the export base. This has led planners to search for suitable new export crops to introduce into the agricultural system. A number of relevant points can be made from the review and analytical work carried out above.

Profitability of Speciality Export Crops

The rapid growth of the vanilla industry in the South Pacific demonstrates that there are good opportunities to successfully introduce new cash crops into existing smallholder agricultural systems. It would be useful for agricultural planners to establish a registry of potential export crops, and categorise them according to the production, processing and marketing criteria outlined in this paper. Existing research processes in agriculture tend to work from the viewpoint of whether the crop or livestock can be successfully grown in a particular agrobiological environment. While this is obviously the most important initial test of a successful export enterprise, it is by no means a sufficient condition. The simultaneous assessment of other criteria needs to be carried out.

Production Conditions

The enduring role of copra as a cash crop in remote areas of South Pacific island countries is due to factors other than its profitability relative to alternative cash crops. It shares with vanilla some of the attractive attributes outlined at the beginning of this paper, albeit to a lesser extent. Other advantages include the multiple end uses of products from the coconut palm, especially use of the coconut for food and drink in the village.

There is another feature which points to the need for caution in the further development of the vanilla industry in remote areas: coconut's forbearance of neglect. Vanilla is a crop that is an intensive user of labour on a regular basis, with yields likely to suffer from neglect of plantation upkeep. The extension role is therefore likely to remain important—more important than in the case of copra production. It is also going to be important for policy makers to monitor labour availability in these remote regions, with the possible need for policy intervention to help prevent the drift of labour to more accessible rural and urban regions. Another issue is the desirability of mixed cropping of vanilla and coconuts. The latter can be a complement for the former in terms of labour use.

A related point concerns the potential effect of low prices on maintenance efforts in vanilla plantations. Tongan vanilla producers have not encountered a prolonged period of depressed prices. There is anecdotal evidence that producers have tended to neglect maintenance of their coconut plantations in such market conditions. Effects of similar actions in vanilla plantations are likely to be much more dramatic, as mentioned above.

Based upon the information which could be obtained, the market outlook for South Pacific vanilla producers is optimistic, albeit more guarded than that of Cornell (1953), who concluded that 'there will doubtless always be a market for all first quality beans which may ever be grown'.

Conclusion

The physical characteristics of vanilla production are such that it is admirably suited to husbandry and processing in the South Pacific. The economics of production (under current and pessimistic price projections) appear favourable relative to other opportunities for similar environments. The social implications of vanilla production also appear to be positive.

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