

Background Report on Commodity Production and Other Economic Activities in the Huon Gulf District, Morobe Province, Papua New Guinea

Report prepared for the



Bris Kanda Rural Economic Development Program
Lae
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Acronyms

ADB	Asian Development Bank
CCI	Cocoa and Copra Institute
CFMDP	Coastal Fisheries Management and Development Program
CIC	Coffee Industry Corporation
CWTP	Community Water Transport Program
DAL	Department of Agriculture and Livestock
FAD	Fish Aggregating Devices
HF	High Frequency
LDA	Local Development Areas
LLG	Local Level Government
MCFDP	Morobe-Madang-Sepik Coastal Fisheries Development Project
MFMA	Morobe Fisheries Management Authority
MLBA	Market Linkages and Business Analysis
NARI	National Agriculture Research Institute
NFA	National Fisheries Authority
NGO	Non-government Organisations
NZAID	New Zealand International Aid and Development Agency
PIFFC	Potsi Inland Fish Farmers Co-operative
PMV	Public Motor Vehicle
PNG	Papua New Guinea
RCFDP	Rural Coastal Fisheries Development Program
VDT	Village Development Trust
WWF	World Wide Fund for Nature

Cocoa

The Morobe Province has never been a large cocoa producer in PNG unlike the New Guinea Islands and Bougainville regions, and currently supplies around 2 % of PNG's total annual cocoa production (Table 1).

Table 1: Cocoa production (t) by year and producer type and % smallholder production of total: 1997-2006

Year	PNG (t)	Morobe Province (t)	Plantation (t)	Smallholder (t)	Smallholder % of Morobe Province total	Estimated production (t) from the Huon District*
1997		787	545	242	31	190-220
1998		252	98	154	61	120-140
1999		610	355	255	42	205-230
2000	30,156	203	115	88	43	70-80
2001	27,231	539	353	186	35	150-170
2002	43,707	840	448	392	47	315-350
2003	40,943	1157	657	500	43	400-450
2004	34,241	831	395	436	53	350-390
2005	43,500	1141	713	428	38	340-385
2006	42,404	779	222	557	72	445-500

Source: PNG Cocoa Board. *Note: Approximately 95 % of all cocoa production from the Huon District is from the Wampar LLG area.

Cocoa production in the Morobe Province overall, as well as production from the plantation and smallholders shows regular fluctuations in production both in volume (Table 1, Figure 1) and value (Table 2, Figure 2).

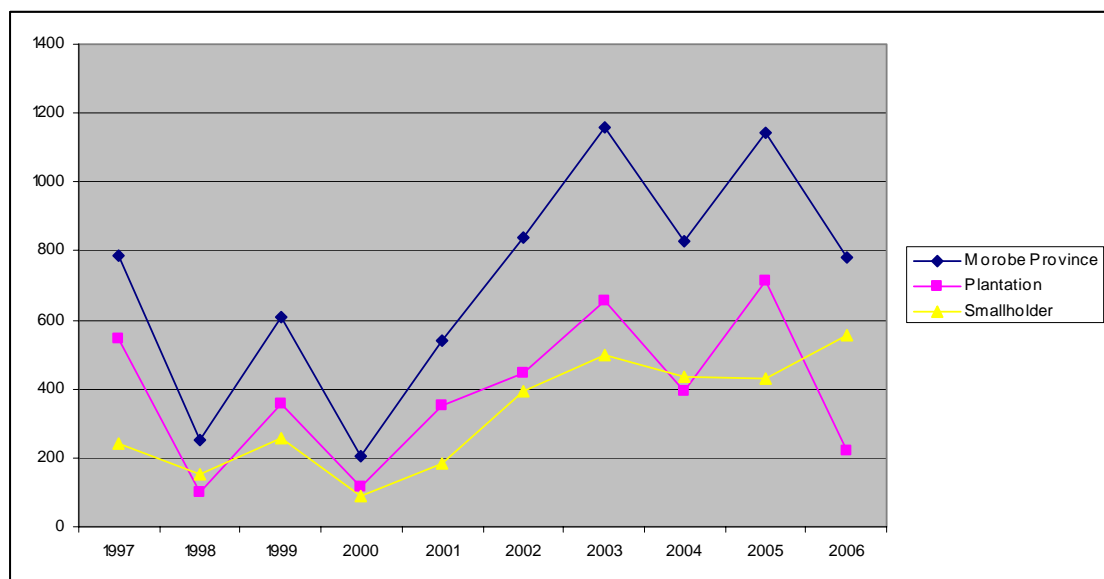


Figure 1: Cocoa production (t) by producer type: 1997-2006

Table 2: Cocoa value (K) by year and by producer type: 1997-2004

Year	Morobe Province (K)	Plantation (K)	Smallholder (K)
1997	1,394,564	965,740	428,824
1998	746,424	290,276	456,148
1999	1,318,820	767,510	551,310
2000	356,265	201,825	154,444
2001	1,691,921	1,108,067	583,854
2002	5,330,640	2,843,008	2,487,632
2003	6,386,640	3,626,640	2,760,000
2004	3,286,008	1,613,961	1,672,047

Source: PNG Cocoa Board.

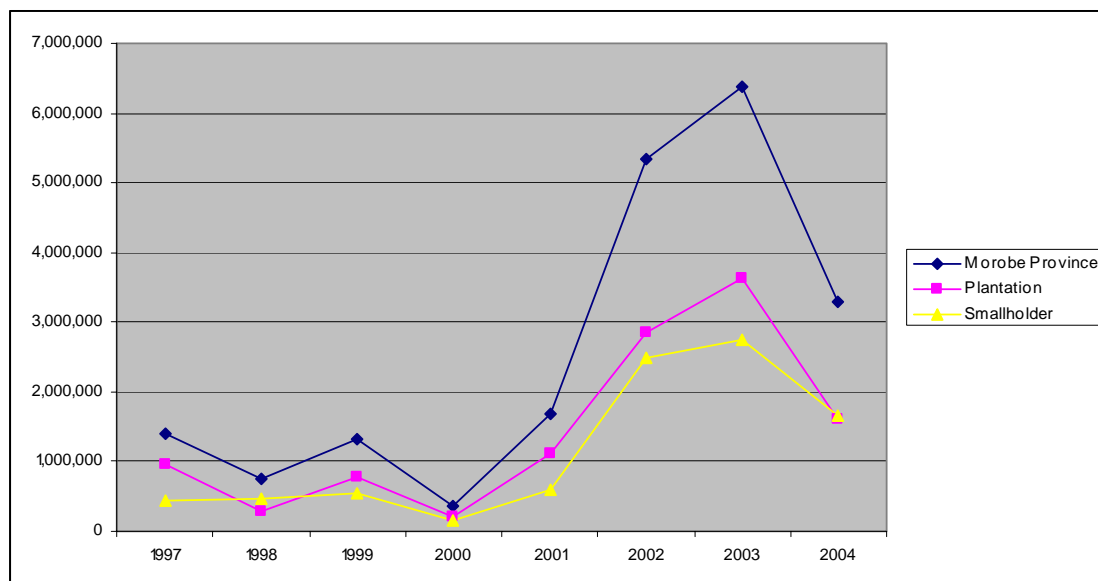


Figure 2: Cocoa value (K) by year and by producer type: 1997-2004

Overall smallholder production has shown an increasing trend as new producers take up cocoa growing as a cash earning activity. This may be partly due to the interventions of the Morobe Province Rural Development Project (later superseded by the Department of Agriculture and Livestock [DAL] and ADB Special Services Contract Facility), but also to the influences of other factors, such as the betel nut blight which began devastating betel nut plantations (and hence incomes) in the early 2000s throughout the Wampar LLG area and certain regions of the Salamaua LLG area. Anecdotal advice from growers suggests that the betel nut blight has also been responsible for an increase in women now growing cocoa to supplement household incomes, which was previously supplied from sales of betel nut.

Estimates from Agmark, the sole buyer and exporter of cocoa in the Morobe Province (from 1995-2005, Agmark exported 57 % of all PNG's cocoa) suggest that 80-90 % of all smallholder cocoa production for the Morobe Province is produced from the Huon District. Of this, 95 % is produced from the Wampar LLG area, and notably only from two main source areas, Yalu and Gabsongkek (near Erap) where the majority of fermentries are located. There are currently 45 fermentries in the Wampar LLG area, with only one in the Salamaua LLG area and two in the Morobe LLG area (Table 3). There are in fact three fermentries at Zare-Ainse in the Morobe LLG area, but the third one is still under construction/renovation (due to problems with financing) and is thus not yet operational. The village of Mou in the Morobe LLG area has also been designated to have a cocoa fermentry installed under the current Member's development funds. There are also plans by the Cocoa and Copra Institute to develop a central processing facility at Gabensis in the Wampar LLG area at the Forestry Station as a pilot facility, and then later transfer it to a private business entity.

Table 3: Location and number of cocoa fermentries

LLG	Place	No. of fermentries
Morobe	Zare-Ainse	2
Salamaua	Popdubi	1
Wampar	11-mile	1
	40-mile (Markham Farm)*	1
	DAL	1
	Gabensis	1
	Jungrik Plantation	1
	Mare	1
	Naromonki	1
	Zifasing	2
	Nasuapum	2
	Munum	4
	Gabsongkek (Erap area)	9
Yalu	21	

Source: Agmark. *Note: Markham Farm is a private plantation and does not take in smallholder cocoa.

Agmark is a public company and is owned by New Guinea Produce Company, which is based in Kokopo, East New Britain. Until 1994 when the company set up in Lae, it bought cocoa in Morobe Province through agents. The Lae-based buying operation employs two buying staff, and three office staff.

The Markham Farm is the only plantation grower of cocoa in the Morobe Province, and has a restricted export licence (from 1995-2005, it exported 3 % of PNG's total cocoa exports). It is an affiliate of the Swires Group (based in Hong Kong Special Administrative Region) and produces plantation cocoa of a very high quality. It has an arrangement with Express Freight Management which stores its cocoa until ready for export. Under the restricted export licence and other conditions, it does not handle any smallholder cocoa, and advice from the CCI suggests that it does not want to because they do not want their reputation tarnished by low quality cocoa beans and do not want to encourage theft from their plantation.

End markets for PNG's cocoa in descending order of importance are the United States, Singapore, Malaysia and Indonesia (Table 4). PNG cocoa is marketed on the global markets as a high flavour dry fermented bean. Stronger flavour cocoa beans, such as those produced in PNG are sought after by the international market for producing higher quality food and pharmaceutical cocoa products. Processors and manufacturers also use PNG cocoa beans as flavouring agents to enhance lower quality beans such as those from Indonesia which are used as filler.

Table 4: Main destinations of PNG cocoa exports: 1996-2006

Country	% taken of total PNG exports
United States	30
Singapore	26
Malaysia	12
Indonesia	11
United Kingdom	5
Thailand	5
Germany	5
Belgium	5
Other	1

Source: PNG Cocoa Board.

In comparison to copra and coffee, cocoa prices have been fairly stable because global demand for cocoa beans has become relatively inelastic and has not been significantly affected by changes in price, in recent years at least (Table 5, Figure 3). Civil unrest in western Africa in the late-1990s-early-2000s caused an increase in prices due to supply deficits.

Given this relative stability, increasing cultivation of cocoa in the Huon District is worth pursuing in regards to Bris Kanda’s goal. For this to happen though, smallholders must have the capacity (skills and knowledge) to access and adopt improved practices and be able to respond to these opportunities to increase their returns. The PNG Cocoa Board has plans to produce 100,000 t of cocoa beans nationally for export by the year 2015, so there is interest from the government agricultural sector (particularly since the launching of the National Agricultural Development Plan: 2007-2012).

Table 5: Cocoa prices (K/t) for buying and selling in the Morobe Province and international price (US \$/t)

Year	Average delivery-in store price (K/t)	Average f.o.b. export price (K/t)	Average international price – New York (US \$/t)
1997	1,772	2,026	1,542
1998	2,962	3,214	1,603
1999	2,162	2,669	1,075
2000	1,755	2,166	835
2001	3,139	3,208	1,039
2002	6,346	6,311	1,714
2003	5,520	6,404	1,755
2004	4,149	5,164	1,517

Source: PNG Cocoa Board. Note: Fluctuations in the kina price can be attributed to differences in the US \$ and kina exchange rates.



Figure 3: Cocoa prices (K/t) for buying and selling in the Morobe Province and New York price (US \$/t)

Cocoa in the Morobe Province is produced and harvested all year round, but has two main peak seasons, called the ‘flushing’ season(s). These two peaks are from May-August (the main peak season) and a smaller peak in December-January (coinciding with the need for money for Christmas celebrations and school fees in the New Year; and interestingly with the coffee flushing season). Agmark is currently buying around 40 bags/day.

The market chain for smallholder cocoa starts with the producer who sells his/her wet cocoa bean to a local fermentary for K 0.40-0.50/kg. When the smallholder sells his/her wet cocoa beans to the fermenter, he/she forgoes any further costs. The fermenter has many additional costs, such as buying the wet beans in the first place, fuel-wood, labour and licenses (a fermentary licence costs K99/yr, a dealer's licence is K 198/yr and an identification card is K 26/yr; licenses need to be renewed annually between 1st September-31st December). It takes approximately 2.5 kg of wet cocoa beans to produce 1 kg of dry fermented cocoa beans. At current prices, it costs the fermenter between K 60-75 to buy enough wet cocoa beans from the smallholder to make one bag of dry cocoa bean for sale. The fermenter also has his/her own cocoa trees (under licensing arrangements, the minimum is supposed to be 3,000 trees, but in the interest of stimulating production, the Cocoa and Copra Institute [CCI] allows fermenters to have less than this amount). After the fermenter purchases the wet cocoa beans, they are processed by fermenting and drying, which takes on average about a week. After the processing procedure, the fermenter will pack the dried cocoa beans for on-selling to Agmark.

When it is time for the fermenter to sell his/her beans at Agmark, transport costs are extremely high. For fermentary owners in the Zare-Ainse area of the Morobe LLG area, freight costs are K 60/bag, plus a passenger fare of K 260/both-ways (a distance of approximately 150 km). For the fermentary at Pobdubi, they first have to either carry bags down (portioned into 20 kg lots) or ferry them down the Fransisco River on rafts to Salamaua, then utilize a dinghy, which will cost K 30/bag in freight and K 60 in passenger fare. For a fermentary operator in the Wampar LLG, transport costs range from K 30-50/bag depending on location and access to transport, plus his/her fare. There are also additional cost of transport from the Aigris market to Agmark for those coming from Morobe and Salamaua LLG areas of K 10/bag.

The current buying price for cocoa at Agmark is approximately K 300/bag (which includes overhead costs, portion of export levy and profit margins). A standard bag is measured at 62.5 kg nett, thus the fermentary owner gets K 4.80/kg as the delivery-in store price (less all his/her costs). At Agmark, the cocoa is inspected, weighed and packed (bulking) into 20 ft containers. These containers hold 240 bags/container, which equates to 15 t of cocoa beans. Containers when full are then shifted to the main wharf and storage fees are paid until a boat is available for export.

The current export price for cocoa is approximately K 315-320/bag (less additional costs; advice from exporters in Bougainville have export prices between K 350-360/bag). Advice from the cocoa manager at Agmark suggests that Agmark only make between 2-5 % profit overall from the business of buying and exporting cocoa. Agmark also states that even if cocoa production increased, they could not buy at a higher price, as prices are generated by the global market and because the PNG Cocoa Board monitors prices paid to the farmers.

One way to possibly increase production is by having smallholders improve the quality of the cocoa beans that they produce. This is something that could be addressed along the whole of supply chain, starting at the fermenter. Agmark as the sole buyer should also have a vested interest in establishing closer more directed supplier relationships with fermentary operators in order to improve the quality and consistency of their raw materials. This is not the case at present, even though Agmark is the sole buyer it does not provide any extension except advice at the buyer door.

Extension services for cocoa production lie with the CCI. Unfortunately even though they are financed directly by a K 40 levy/t on export that goes to the PNG Cocoa Board, of which 60 % is to be turned over to the CCI for operational funding, the CCI still lacks adequate human and financial resources to conduct extension services. Subsequently, extension services and technology transfer are still lacking, particularly in the Salamaua and Morobe LLG areas. For example, people have cleared land at Busama in the Salamaua LLG area, and have 5,000 poly-

bags to grow seedlings, but have no seeds. In the Wampar LLG area there are an estimated 50,000 poly-bags distributed, but again no seeds are available.

The biggest challenge to increasing cocoa production is increasing smallholder productivity from the current yield estimates of 200-350 kg/ha; plantations average between 1-1.5 t/ha (average of 600 trees/ha). With the new hybrid variety of cocoa, smallholders could be harvesting cocoa within 3 years and producing considerably more. The only problem is that the hybrids have a life span of approximately 5 years before they need rehabilitating or replanting, though through genetic manipulation this is thought to soon double. The older variety of cocoa takes four years to mature and can produce 1 t/ha under careful management, but has a life span of 25 years.

Current area under production is estimated at approximately 1,350 ha in the Wampar LLG area. From a recent field visit with the Bris Kanda Program Manager to the Zare-Ainse area, fermentary operators and community members stated that there was probably 50-60 current producers in that area (there are apparently 15,000 cocoa trees already planted, though not all are worked, with another 20,000 recently planted and ready to come into production).

The Wampar LLG area has very high potential for further development in the populated areas on the plains of the Markham River between Nadzab and Lae (where the majority of fermentries are located, including the Yalu Plantation area) and cocoa has moderate potential for the higher coastal ranges, particularly around Salamaua Point in the Salamaua LLG area and the Waria Valley in the Morobe LLG area.

The development constraints of the cocoa sub-sectors are several, and include declining yields due to poor block management or up-keep; shortened productive life of cocoa trees due to inadequate treatment of pest infestations (the cocoa-bod borer is a real threat) and disease; insufficient supply of genetically improved varieties; inadequate extension services; restricted access to farm credit (coupled with high interest rates); poor quality of cocoa beans produced; poor transport and marketing infrastructure; and law and order problems.

As a priority activity, Bris Kanda should support CCI to do surveys of all fermentries in the Huon Gulf District and establish the number of smallholders selling to those fermentries and the numbers of trees in production, in need of rehabilitation and just planted and not yet producing. Such a survey would also assist Bris Kanda identify areas for immediate intervention. It should be noted though, that only certain areas within the Huon Gulf District will be suitable for cocoa development, rehabilitation or expansion; mostly restricted to areas along the coast and river valleys.

Coconut

Formal development of coconut plantations (for the production of copra) in the Huon Gulf District began in the 1930s following the introduction of the Plantation Ordinance in the 1920s. Further plantation expansion occurred in the 1950s under the Copra Co-operatives and church initiatives. These co-operative societies never became a major force in smallholder marketing, with most failing in a very short period of time due to a lack of capital for further expansion, distribution and equity problems, and the usual problems of mismanagement and corruption.

The most notable area of coconut plantations in the Huon Gulf District is at Bau and Kobo areas of the Morobe LLG areas, with smaller coconut plantation also established at Lababia and Busama in the Salamaua LLG area. Markham Farm in the Wampar LLG area dominates.

Copra production in the Morobe Province has previously wavered around 2,000 t/yr since Independence. Copra production has been estimated by the CCI to be between 500-750 kg/ha for smallholders and 1,500-3,000 kg/ha for plantations.

There has been no smallholder production of copra in the Morobe Province in recent years because the income return on labour inputs is too low (advice from CCI suggests that the buying price of copra would be between K0.10-0.20/kg if someone was to buy) and the cost of transport is too high. Out of all the previous plantations in the Morobe Province, only Markham Farms is still producing, and sells to the copra oil mill in Madang (advice from CCI suggest that buying price is approximately K 600/t for 1st grade copra, K 400/t for 2nd grade and K 300/t for 3rd grade).

There is also a considerable domestic trade in dry and drinking coconuts in Lae and also a sizeable inter-provincial market for consumers in the Highlands. These coconuts usually sell for between K 0.40-0.80 depending on availability and demand.

Due to the low returns and the fact no one is buying copra in Lae, CCI's emphasis is on value-added, down-stream processing. At the request of the Hon Member for the Huon Gulf District, Sasa Zibe, CCI has drawn up the Huon Gulf Cocoa and Coconut Development Project, which would see the establishment of Direct Micro-expellers and dryers for production of virgin coconut oil. These would be placed at Morobe Station in the Morobe LLG area, at Busama in the Salamaua LLG area and at Yalu/Jungrik Plantation, Munum and Gabsongkeg in the Wampar LLG area.

Bris Kanda could place some effort in supporting CCI in redeveloping and rehabilitating coconut plantations using hybrid-planting materials to replace older and senile palms. Bris Kanda could also assist in research and training into downstream processing coconuts into oil (for cooking, cosmetics and as a bio-fuel), soap, candles, livestock feed (chickens and fish, recent studies by the National Agriculture Research Institute [NARI] have produced a manual for village-based feeds), biscuits, charcoal, fibre (for rope, doormats, etc.) and wood.

The National Fisheries College has produced a detailed assessment of the feasibility of commercial production of coconut oil as an alternative fuel for diesel in both fisheries and community applications. Equipment is available in Lae through Project Support Services Ltd.

Coffee

Coffee has been promoted in the Morobe Province since the 1950s, and the Morobe Province has contributed an estimated 6 % of all PNG's total exports since 1975-2000. It has been estimated by the Coffee Industry Corporation (CIC) that between 20-30 % of all rural households in the Morobe Province are involved in growing coffee (mostly in the Aseki, Menyamya, Boana, Watut, Finschafen areas). In the Huon Gulf District the main producing centres are the highland regions in the north-western corner of the Wampar LLG area, Hote-Yamap in the Salamaua LLG area and the northern Waria region in the Morobe LLG area. Advice from the coffee mills and Niugini Coffee is that the Huon Gulf District is not a large producer of coffee in the Morobe Province.

According to the CIC there are no accurate figures for production from the Morobe Province as coffee buyers are unregulated (only exporters are licensed and need permits from the CIC to export) and coffee is also sold to the Highlands (which is then brought back down to Lae for export). It is thought, however, that coffee production for the Morobe Province is between 3,000-5,000 t/yr (all of it smallholder).

There are four mills in Lae (Yhahauka at 14-mile, a new mill at 11-mile, Bewapi Coffee at 9-mile and Niugini Coffee, Tea and Spice Ltd [hereafter called Niugini Coffee] at 5-mile), with another four regional mills located at Asiki, Wasu, Wau and Erap (the latter falling inside the Huon Gulf District).

There is only one coffee exporter in Lae, Niugini Coffee, which is part of the Mainland Holdings group of companies. This is a 100 % nationally owned company originally established from

coffee growing business groups (there is one business group located in the Salamaua LLG hinterland area above Buakap which owns 10 % of all shares) who sold to the 5-mile mill, and later bought it, and then expanded into commercial poultry farming, transportation, electrical supplies, crocodile farming, flour milling and packaging. Advice from Nuigini Coffee suggests that they obtain about 50 % of all their coffee for export from coffee milled at the Bewapi Mill, 90 % from the Yhahauka Mill (which is financed by Nuigini Coffee), and 100 % from their 5-mile plant. They also buy coffee from around PNG for export.

As noted above, coffee produced in the Morobe Province is also sold to companies based in Goroka, with Lae-based transport companies acting as agents. For example, Nuigini Mainland Coffee has a relationship with Express Freight Management Ltd, while PNG Coffee Exports has a relationship with East West Transport. These companies offer incentives to buyers and agents by offering to pay all transport costs.

Coffee production is variable depending primarily on the age of the tree, and the intensity of management (Table 6). Trees usually have about five years of full production and then need to be rehabilitated. Once the coffee is ready, it is picked as a cherry and then but through a ‘pulper’ which removes the outer flesh to leave parchment. The recovery rate of parchment to cherry is approximately 20 %. The parchment is then dried (usually in the sun) until ready for shipment to the mills or sold to a buyer. The rate of recovery for parchment to green bean is 70 %. Coffee mills charge 30 t/kg for removing the parchment.

Table 6: Estimated green bean yields (kg/ha) for Arabica by growth year

kg/ha	Growth year
200-500	3
500-1,000	5
1,300-1,600	6
1,600-2,000	7
1,100	Rehabilitated
800	Un-rehabilitated

Source: Coffee Industry Corporation

The main flushing season for coffee is similar to cocoa with peak production in May-August and a smaller one in December-January. Current delivered-in store price to buyers (with the exception of Niugini Coffee who offer full-price for their business groups) for parchment coffee is around K3.50-3.90/kg for Y-grade Arabica (Y-grade is the product of smallholders, as is PSC, which is the best, Premium Smallholder Coffee; Table 7). Buyers will then on-sell to Niugini Coffee (or to the companies based in the Highlands) who pay around K 6.10/kg for green beans. Inside this buying price is the exporter’s margin to cover operational costs as well as profit. This margin depends on costs of operation and the target profit, as well as other factors such as stock position, the level of competition between exporters, the available supply (shortage or surplus), the supplier’s record and relationship with the exporter, and so on. Current export price is around K 6.80-6.90/kg (there is also a K 0.10/kg export levy as well). Ninety percent of the coffee exported by Niugini Coffee is bulk exports whereby loose green bean is blown into a bag-filled container, which holds 18 t of green bean. The remaining 10 % is exported in hessian bags. Niugini Coffee estimates that they export approximately 500 containers/yr, with 70-80 % coming from their two sister mills in the Highlands.

Table 7: Smallholder coffee grades for export

Grade	Bean Size (mm)	Bean shape	Colour
PSC	>15	Mixed	Light green to green
Y1	Mixed	Mixed	Mixed light green
Y 2	Mixed	Mixed	Mixed light green

Source: Coffee Industry Corporation

Some smallholders in the Huon Gulf District are able to take their coffee directly to the mill door, but many cannot. In many places where there are accessibility problems, coffee is neglected or not harvested or only partially harvested. For growers in the Salamaua LLG area, especially in the Hote area, they have to carry their coffee down to Buakap on the coast and then travel by dinghy to the mills and buyers. For those in the Morobe LLG area they have to carry it up to Biaru, and pay carriers between K 2-5/bag, and then get a PMV down to Lae. Coffee from the Huon Gulf District that makes it way up to the main Bulolo-Wau-Lae road will be charged around K 50/bag in freight on a PMV, plus the seller's fare on top.

Law and order is a serious problem with many buyers reluctant to go in and buy at the farm gate, coupled with this, is the poor state of road infrastructure, and the high cost of transportation to freight coffee from the farm gate to the mills and markets in Lae. Previously many buyers would give out advances to village-based buyers to purchase coffee, which they would then pick up on a regular basis. Most have now stopped this practice, except for especially trusted people as the money was quickly misused, and spent by village-based buyers on his/her/family's other immediate needs rather than buying coffee.

Buyers that do venture into rural areas (they will stagger their visits, i.e. come a few days early or a few days late to confuse would be robbers), usually buy around 20 bags (this is the amount that can be transported by a Land Cruiser utility). Buyers will usually buy for K 1.80-2.50/kg on feeder roads, and K 3.30/kg on main roads. Nowadays, some buyers set themselves up at strategic locations along the main roads to buy coffee from growers. Proper attention to road maintenance would make the coffee industry much more profitable (advice from one buyer stated that before the roads had deteriorated, one buyer obtained 400 bags in one week from Yamap in the Salamaua LLG area).

The PNG coffee industry is targeting the quality coffee market, which forms only 5 % of the total world coffee market, through the promotion of high quality Arabica coffee. The main export destination for PNG coffee is Germany (Table 8).

Table 8: PNG exports by destination: 1995-2000

Destination	% of total exports
Germany	55
Australia	19
Others	12
Unites States of America	6
United Kingdom	6
Japan	2

Source: Coffee Industry Corporation

The CIC is the organisation mandated to undertake coffee extension and development activities. It charges a K 0.10/kg export levy on all exports. The CIC is encouraging farmers to form farmer groups or co-operatives and operate through them. As yet there are no co-operatives in the Huon Gulf District (there are 11 groups established in other parts of the Morobe Province, and another four pending). The CIC also suffers from similar problems as CCI with low financing and lack of manpower to adequately fulfil extension services.

Betel nut

Betel nut was a major inter-provincial export commodity (pre-dominantly to the Highlands Region) from the Huon Gulf District, and still is in some localities which have not been afflicted by the betel nut blight. In the Wampar LLG area, a large number of fallows were planted in betel nut in the early 1990s (estimated at the time to be several hundred trees/household) because of high prices being received at markets in Lae and at the 40-mile Market on the Highlands Highway, west of the Nadzab airport. Because of the betel nut blight, there is now regular

movement throughout the Huon Gulf District in search of betel nut supplies, and there is a 'trade route' from Popondetta-Lae-Highlands.

Betel nut is sold by the hand (a branch of a bunch), by the bunch, but most often by bag (usually a size 25 or 50 kg stockfeed bag or rice bale bags). A hand of betel nut will sell for between K 5.00-6.00, whilst a size 25 kg bag will sell for around K 50-80, and K 100-150 for a 50 kg bag. A size 25 kg bag can hold between 70-90 kg of betel nut, whilst a size 50 kg bag can hold between 120-150 kg of betel nut. Betel nut is sold in the markets and street stalls in Lae as individual nuts usually for K 0.30-0.50/nut depending on season and availability.

Due to the aforementioned betel nut blight, the 40-mile market on the Highlands Highway in the Wampar LLG area has essentially collapsed. The decline in the betel nut trade has had a flow on effect on other rural businesses, particularly in the Wampar LLG area. The collapse of the betel nut economy has forced many people back into cocoa production (which had been largely neglected in areas with large betel nut plantations), with many people now planning to plant cocoa. Advice from growers in the Gabensis area of the Wampar LLG area suggest that more women are now moving from betel nut to growing cocoa to sustain household incomes.

Vanilla

The Morobe Province does not produce much of PNG's vanilla, and there are no current production figures available. Vanilla was heavily promoted by DAL in the late-1990s due to the boom in prices experienced in the wake of the decline in yields from traditional source countries, like Madagascar. Some growers in the Huon Gulf District made money during the boom years of 1998-2004, but the amounts were not large, unlike the incomes received in the Sepik Region.

One of the problems with growing vanilla in the Huon Gulf District is that it needs a period of a few months dry weather to produce best, and much of the Huon Gulf District is either too wet as in the Salamaua and Morobe LLG areas or too dry as is some areas of the Markham Valley in the Wampar LLG area.

There are two species of commercial vanilla grown in PNG. These are *Vanilla planifolia* and *V. tahitensis*. An endemic species, *Vanilla wariensis* is being mistakenly cultivated by uninformed farmers, particularly in the Morobe LLG area, and has no commercial value.

There are no current full-time buyers of vanilla in Lae. When contacted, previous buyers stated that they no longer were purchasing vanilla because the price was too low. Papindo is buying, but purchases only from other provinces. Agmark occasionally buys (it has a current contract to supply 300 kg of vanilla). During 2003, Agmark was exporting out of Lae to Indonesia between 2-12 t/mth of vanilla (some of this would have been purchased from other provinces). Current buying price by Agmark is around K 30/kg.

There is also currently no idea of the number of producers of vanilla in the Huon Gulf District or the area planted. Plots observed by the author in Busama in the Salamaua LLG area were small, around 20 m². Because the labour requirement for vanilla production is high (around 400 man-days/ha/yr), smallholders should only concentrate on small blocks as it is better to have a small productive block than a large, poorly managed, unproductive block. The main inputs for vanilla production are planting materials of vanilla and shade trees. Vanilla cuttings cost K 1/each.

Vanilla is sought after in international markets for its unique flavour (currently 95 % of world demand for vanilla flavour is now satisfied by relatively inexpensive synthetic vanilla). Unfortunately, PNG has quality and quantity issues and PNG has a tarnished reputation on the world market because of bad practices during the early-2000s boom. Most farmers do not pollinate or harvest on time and therefore lose productivity; this means there is low or variable availability for a stable market, and low volumes result in high overhead costs for buyers and

exporters. There is also no systematic method of curing amongst smallholders, which affects vanillin content and subsequently the grade (and the price).

The long time taken before a positive cash flow (it can take up to seven years) is achieved is also a problem in maintaining smallholder interest in vanilla production, and if crops are neglected or poorly managed it is doubtful that projected yields will be obtained (it takes five kg of green vanilla beans to produce one kg of cured beans).

Vanilla should only be promoted by Bris Kanda in the Huon Gulf District as a minor cash crop, integrated with cocoa and other food crops. Opportunities for certified organically grown vanilla should be investigated, as certification will increase the buying price, though the issue of quality and quantity still remain.

Rice

Rice (*Oryza sativa* L.) was introduced into the Morobe Province by the early Lutheran missionaries, and promoted in the Huon Gulf District after World War II (WWII). During the 1970-1980s, demonstration plots were set-up by the DPI and in the 1990s; DAL introduced new Taiwanese varieties to increase yields.

Because of the ravages of the taro beetle and the alomoe-bobone virus in the Huon Gulf District, rice growing has increased in importance, particularly in the Morobe LLG area. Smallholder rice is usually cultivated in the Morobe LLG area on plots less than 1 ha (averaging 0.5 ha), with most of the rice growing along the Waria River, from Dona to Pepeware. Coastal villages like Kobo, Sapa and Sowara are also involved. During the period 2001-2003, 58 t of paddy was delivered to the three rice mills in the Waria Valley, fixing a mill recovery return of 33 t (average milling recovery is approximately 60 % of the paddy weight).

The growing of rice has previously been promoted in the Huon Gulf District as a cash crop and many farmers in the Morobe LLG area started cultivation believing that they would make good returns out of it. It is actually quite difficult to grow rice on a commercial basis (rice is highly labour intensive, and sensitive to soil fertility and moisture stress, pests and disease) and many smallholders questioned the practicability of commercial rice production. Even though Trukai Industries has upgraded their mill to accept local rice, the growing of rice in the Huon Gulf District is better promoted as a subsistence and semi-commercial crop, with smallholders simply selling the surplus from their harvest and consuming the rest themselves. Village smallholders sell their surplus in local markets between K 2.50-4.00/kg.

Peanuts

Nearly all peanuts produced in PNG are consumed domestically as food, although significant volumes of peanut products (nuts, oil and butter/paste) are also imported, which would suggest that there is good scope for expansion of domestic production and processing to replace imports.

During the 1950-1960s, large volumes of peanuts were exported (averaging around 2,000 t/yr) from the Morobe Province to Australia and a factory was established to produce peanut butter, most of which was consumed locally. Peanut production slowly declined from this peak period, in part due to the poor returns to growers.

In the last few years, peanut production and trade has increased due to a rapid decline in the yield of betel nuts (due to the aforementioned blight), with women in the Wampar LLG area now devoting much time and effort to the production and marketing of peanuts. In a recent survey by Trukai Industries, peanuts were ranked as one of the top five income generating crops in the Markham Valley (the number one priority was training in book keeping and savings), and for some households it provides up to 75 % of all income.

In the Markham Valley, peanuts are usually planted between January-March, however some people also cultivate peanuts in the off-season (despite lower yields) to take advantage of higher prices and better market demand. Peanut garden sizes range from 0.02-4.8/ha (160,000-200,000 plants/ha) producing between >0.9-2t/ha, with a monetary value of K 890-1,250/ha/yr.

Peanut cultivation is a communal family effort, with man and women involved in differing stages of production. Many farmers in the Markham Valley hire tractors (around K 200/day) for plant preparation, while hired labour is used for other operations. Harvesting takes place 3-4 months after planting.

Current urban demand in Lae is estimated at 11.2 t/wk. Growers also get excellent returns selling peanuts to middlemen/women from the Highlands who retail them in their home provinces. Marketing was considered to be only a minor problem in the Markham Valley in the recent survey by Trukai Industries (ranking 5th out of 10 places in importance).

Peanuts are sold as fresh, boiled, roasted, dried on a bunch or loose; or fried and salted. Fresh peanuts on the bunch are preferred. Wholesale prices change with demand and supply, during the seasonal peak period, the market is flooded with peanuts, prices between the peak and off season can be as high as 1:4 in pricing.

Major constraints to increasing peanut production in the Huon Gulf District (in fact all of PNG) is the high presence of aflatoxin (which can affect the functioning of the immune system in humans). Aflatoxin is a group of toxins produced in peanuts by the fungi *Aspergillus flavus* and *A. parviticus* under specific moisture and temperature conditions and can occur during production, harvest and storage. Other constraints include disease, pests, pod borers (which can be addressed by simple chemical seed dressing and can improve yields by 50 % at an average cost K 21-41/ha). Predation by parrots and rats is also a problem.

Spices and Fruits

The Lae Main Market is quite a good market, but is already well supplied with fresh food (during the wet season between October-March there is a surplus of vegetables, in the dry there are more watermelons and mangoes and less vegetables).

Cardamom (*Elettaria cardomum*) and chillies (*Capsicum frutescens*) were heavily promoted in the Morobe Province during the 1980-1990s, but marketing arrangements collapsed in the late 1990s, when the DAL's Produce Marketing Division was disbanded. There are currently no companies involved in marketing spices because of poor quality produce and unstable market prices, and there have been no exports since 2000.

There are possibly small niche markets for Asian consumers inside of PNG for exotic fruits like durian (*Durio zibethinus*) and mangosteens. The Lae City Mission operates the Suambu Plantation at 9-mile for disaffected youth and produces a wide range of fruits. They regularly sell all their mangosteens and durians at the Lae Main Market. They also produce kava for export.

Galip nuts (*Canarium indicum*) have the potential to be marketed as an alternative to the comparatively more expensive macadamia nut. A feasibility study on galip nut funded by ACIAR in 2004-2005 concluded that galip nut was a very feasible export tree crop for PNG. An evaluation study from 2003-2006 by the EU on the commercialisation of a wide-range of alternative cash crops, also chose galip nut (and nutmeg) for major development. An advantage of promoting galip nuts is that the trees can be inter-cropped with cocoa, coffee, pepper, vanilla and kava by offering shade.

Pepper (*Piper nigrum*) production is less intensive than vanilla in terms of labour and skills required. Flexibility in spacing allows for inter-cropping between vines and the option of

planting under larger commercial tree crops such as cocoa. It also takes 2-3 years before pepper is ready to harvest, a similar time to the new hybrid cocoa trees. Dried black peppercorns are less perishable than green vanilla beans, subsequently they face lower marketing constraints. Problems with marketing pepper are that there currently are no buyers and pepper appears to be affected by cyclical price fluctuations (usually on a seven year basis).

Nutmeg (*Myristica fragrans*) takes up to seven years to produce, but once in production can yield for up to one hundred years.

Mango (*Mangifera indica*) has potential for exports to the Highlands, but only from superior varieties. Current varieties are of poor quality. The ideal location for mango production is the Upper Markham in the Wampar LLG area as the dry season is not so severe there.

Major constraints to the fresh produce and spice trade are poor transport infrastructure, and unreliable and infrequent transport. For fresh produce there is also a lack of capacity and poor facilities at markets, a lack of refrigerated containers, poor marketing and extension advice with linking production to market demand. Markets also suffer from poor quality control and product inconsistency.

Fishing

The Morobe Province has a long history of fisheries development dating back to pre-independence. In the 1960s, expatriate buyers began purchasing fish from village fishers along the Huon Coast and retailing their purchases in Lae, with the result that fishing became the mainstay of the cash economy for many communities in the Salamaua and Morobe LLG areas.

In 1972, the Voco Point Fisheries Station was established with the purpose of providing training to village fishers on fishing techniques, net making and repair, maintenance of outboard motors, fish handling, ice box construction, and the proper use of ice. Following the establishment of the Voco Point Fisheries Station, several fisher groups, co-operatives and associations were established and registered under loan mechanisms with the Rural Development Bank. The transport of fish from the Salamaua and Morobe LLG areas was provided by private boats transporting both iced and frozen fish to the Voco Point fish depot. Fish ponds were also introduced into the Wampar LLG area.

Fishing interest again increased in intensity with the arrival of the German Development Service sponsored Morobe-Madang-Sepik Coastal Fisheries Development Project (MCFDP) in 1987. This project was jointly implemented by the Morobe Province's Division of Fisheries and Marine Resources and was headquartered in Lae at the Voco Point Fisheries Station (the current location of the Morobe Fisheries Management Authority [MFMA]) and ran until 1999 (a twelve-year program).

The MCFDP was established on the assumption that coastal fisheries resources in the Morobe Province and neighbouring provinces were under-utilised and therefore able to sustain a substantial increase in exploitation rates. With little activity in the agricultural cash crop sub-sector at the time, it was expected that by providing infrastructure and introducing new technologies, providing fishermen with a dependable market, affordable access to ice, and outreach support directed at making village fishing and transport systems more cost-effective, that the artisanal fisheries sub-sector would develop and create employment opportunities and generate income for coastal and island villagers throughout the Morobe Province. During the course of the MCFDP it became evident that the emphasis on exploitable fish resources and technical solutions was not working and that the productivity of artisanal fisheries lacked constancy. Part of this reason was attributed to the low prices paid by the MCFDP (from 1992-1996, the buying price remained around K 2.50/kg).

Since the MCFDP ended, much of its infrastructure was incorporated into the Division of Fisheries and Marine Resources. The intent was to eventually lease these facilities to the respective local level governments, but because they lacked the necessary funding, this never happened. The fisheries centre at Morobe Station in the Morobe LLG area, was then taken over by the Sinugu Business Group in 1997 which operated the ice plant at Morobe Station and maintained small buying points at Bau Island, Lasanga Island, Maiama and Wabezeira (it had been previously offering a carrier service from Morobe Station). The Sinugu Business group was supported by heavy subsidies from the then Hon Member of the Huon Gulf District, Tukape Masani, who was also the founder and patron of the group. The business group did not last long and the fisheries centre is now in need of some serious renovations. Part of the problem encountered by the Sinugu Business Group was the low prices they paid to fishers, and subsequently fishers did not sell them their catch.

Production figures for the landings at the Voco Point Fisheries Station during the MCFDP show increasing production until 1996 and then a quick decline afterwards as the MCFDP wound down (Table 9, Figure 4). After the demise of the MCFDP and the failed attempts by the government to run the station and other privatization ventures, Maps Tuna utilised the premises for landing and processing tuna. Due to the high costs involved and difficulties in accessing air freight, Maps Tuna has now closed doors. Maps Tuna was also acting as the Private Sector Partner for fishers who were operating fishing vessels under a loan scheme by the European Union's Rural Coastal Fisheries Development Program (RCFDP). With the collapse of Maps Tuna, and because higher prices were/are offered by supermarkets and restaurants, all fish products now go to these places. Zenag is now utilising the facilities of Maps Tuna part-time to process tuna from their mini-longliner for export.

Table 9: Fish production (kg) for the Morobe Province by species group: 1992-1999

Year	Large pelagic fish (kg)	Small pelagic and inshore fish (kg)	Demersal hard bottom fish (kg)	Coral reef fish (kg)	Squid, mud crabs, prawns, lobster tails (kg)	Total Volume (kg)	Total Value (K)
1988	No data available					79,494	
1989	No data available					106,503	
1990	No data available					89,156	
1991	No data available					104,773	
1992	No data available					96,975	
1993	21,824	10,152	41,847	26,736	23,989	124,548	
1994	28,382	21,256	40,137	23,218	25,230	138,223	
1995	32,443	17,415	38,299	28,331	21,714	138,202	349,995
1996	28,978	17,735	34,527	31,226	21,816	134,282	337,650
1997	22,488	12,194	25,114	24,370	15,938	100,104	303,444
1998	28,651	20,301	30,369	18,063	1,005	98,389	323,515
1999	13,983	11,256	12,139	12,096	1,019	50,493	179,617
Total	185,391	113,762	239,122	174,222	116,858	829,355	1,494,221
% of Total	22	14	29	21	14	100	

Source: Morobe Coastal Fisheries Development Program.

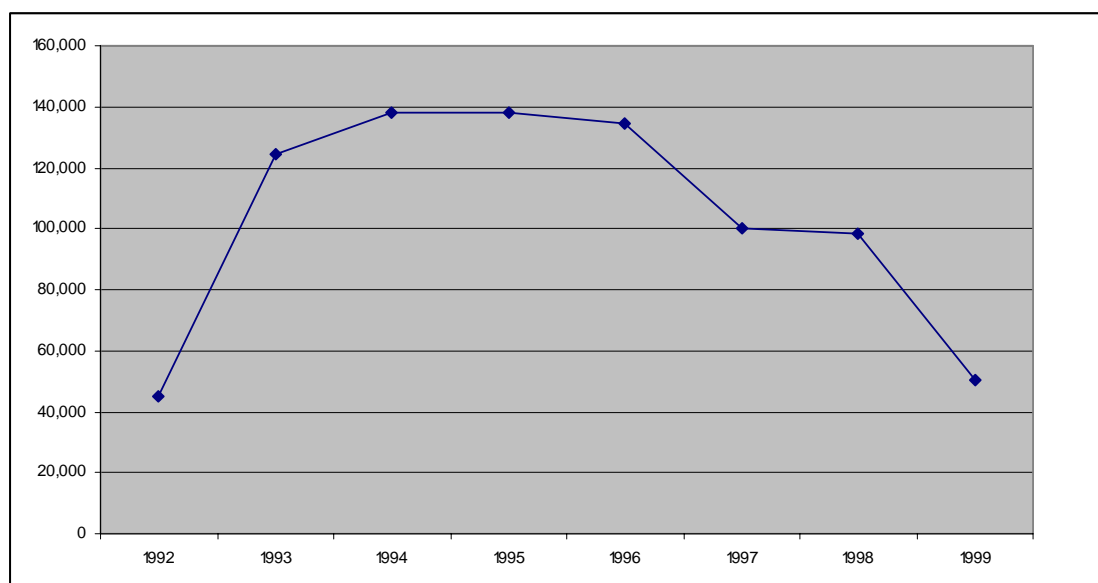


Figure 4: Fish production (kg) for the Morobe Province: 1992-1999

As a corresponding trend with the Morobe Province, fish landings from the Huon Gulf District also took a downward trend since the cessation of the MCFDP (Table 10, Figure 5). During the MCFDP, Salamaua and Morobe LLG areas were consistently the highest producing areas in all of the Morobe Province. During the time of the MCFDP was operational there was 270 fishing groups registered from the Huon Gulf District. On average only about 150 fisher groups in the Morobe Province regularly landed fish each year, with approximately 20 groups being regular suppliers each year (mostly from the Salamaua and Morobe LLG areas).

Table 10: Fish production (kg) by LLG area in the Huon Gulf District: 1987-2002

Year	Morobe	Salamaua	Wampar	Total
1987	13952	8747		22699
1988	10851	20834		31685
1989	30174	27831	2268	60273
1990	18285	41797	956	61038
1991	33525	51328	2201	87054
1992	29992	37889	2225	70106
1993	50559	37426		87985
1994	59045	55281		114326
1995	61403	47459	1924	110786
1996	40160	49470	1249	90879
1997	17830	30343		48173
1998	39335	27262	583	67180
1999	15018	21059	640	36717
2000	19091	17599	406	37096
2001	9808	6530	312	16650
2002	9099	5318		14417
Total	458127	486173	12764	957064

Source: Morobe Coastal Fisheries Development Program.

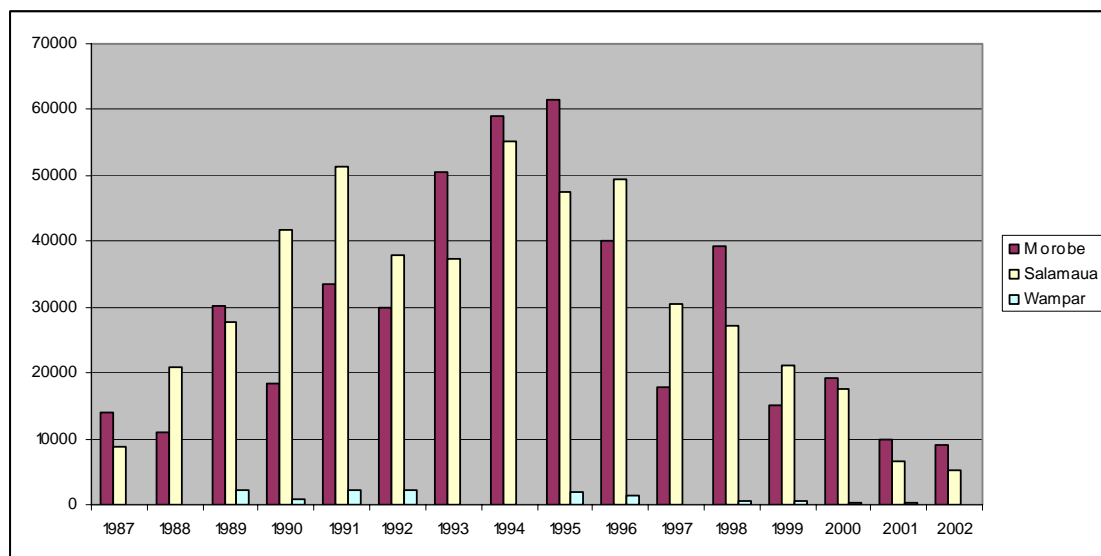


Figure 5: Fisheries production by LLG for the Huon Gulf District : 1987-2002

Actual fisheries production was significantly much higher than those represented above because estimates during the course of the MCFDP suggest that up to 74 % of all fish caught was being consumed in the village and that only 26 % was sold for commercial purposes (spoilage accounted for 2.5 % of all fish landings). Of this 26 %, 78 % was sold to the Voco Point Fisheries Station, while the remaining 22 % was sold as fresh fish (19 %) at the Lae Main Market, supermarkets and hotels, with the remainder sold as smoked fish. Recent surveys by the CFMDP show that 61 % of all fish from all villages surveyed in all LLG areas is consumed in the village, with 39 % sold at the Lae Main Market, supermarkets and hotels. The total informal sub-sector catch for the Morobe Province has been previously been estimated by the MCFDP to be approximately 600 t/yr.

During the MCFDP, villages in the Salamaua LLG area were the highest producers in the Huon Gulf District (Table 11). While some communities were relatively consistent in their landings, there were seasonal fluctuations in landings (higher landings in February-May and October-November) due to cultural and other social factors (such as fishing for funds for Christmas celebrations and school fee obligations) as well as weather patterns.

When the MCFDP started, the Lababia community was the most productive of all fisher groups, and a communal community fishing project was started with assistance from the VDT and the World Wide Fund for Nature (WWF). Due to the socio-cultural fabric of the Lababia community, a further 18 fisher groups were established shortly after illustrating that some individuals and sub-clans were not committed to supporting the community fishing co-operative, and within six months of its inception the co-operative fishing project collapsed.

In fact, most fisher groups from all LLG areas dissolved soon after establishment or would only operate intermittently with many only supplying fish for a few months and then would cease, either due to a lack of working capital, or other subsistence activities, which would cause the group to split up. Subsequently, the supply of fish coming into the MCFDP fluctuated and it appeared that participation by village fishers was based only on short-term needs such as social obligations.

Table 11: Fish production (kg) by Huon Coast village: 1987-1998**Morobe LLG**

Place	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Bosadi	2,449	4,145	2,846	2,054	1,074	842	10,875	33,222	27,951	10,494	3,238	8,746	107,936
Paiawa	3,150	687	2,239	3,246	16,101	7,571		6,774	10,655	6,746	1,096	9,100	67,365
Buso			8,785	4,319	3,242	4,057	5,971	3,505	7,408	6,633	2,938	2,392	49,250
Siboma	1,656	1,213	10,133	4,337	1,080	2,639	2,154	2,469	5,807	4,266	4,973	4,320	45,047
Kui	4,216	1,967	2,827	1,794	1,484	3,313	4,338	2,368	4,963	6,987	3,115	6,056	43,428
Maiama	1,282	892	1,747	1,704	6,272	4,277	2,808			2,024		4,139	25,145
Asini	274	434	1,597	831	2,332	503	1,243	3,084	1,885		2,470	2,378	17,031
Sapa	130	470				505	11,263	3,760					16,128
Wainsodunu						4,318	5,408			3,010		2,204	14,940
Eiya	158	244				634	6,499						7,535
Amoa	596				846				2,734				4,176
Kobo								2,687					2,687
Bau					1,094	832							1,926
Mou								1,176					1,176
Eware	41	799				218							1,058
Zare						262							262
Pema						21							21
Total	13,952	10,851	30,174	18,285	33,525	29,992	50,559	59,045	61,403	40,160	17,830	39,335	405,111

Salamaua LLG

Place	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Busama	1,135	2,960	6,454	10,436	14,631	12,500	10,852	17,722	24,216	21,410	10,320	8,545	141,181
Buakap	2,475	4,983	4,377	13,435	10,749	9,065	11,267	15,332	10,916	8,012	7,880	8,214	106,705
Lababia	1,688	6,347	11,228	9,215	15,811	7,400	4,222	4,433	2,804	4,469	1,793	3,425	72,835
Laukanu	1,896	5,496	3,393	2,023	1,803	4,608	5,475	4,676	4,747	10,975	4,250	5,339	54,681
Keila	7	119	78	3,412	4,498	1,375	1,452	6,405	3,019	1,589	2,307		24,261
Salus	1,546	929	1,848	2,739	2,275	54	1,020	1,231		3,015	3,793	1,739	20,189
Ainse						931	3,138	3,567					7,636
Buansing			375	537	1,319	1,142		1,915	1,757				7,045
Laugui						470							470
Kelkel					144	295							439
Salamaua			78		98	49							225
Total	8,747	20,834	27,831	41,797	51,328	37,889	37,426	55,281	47,459	49,470	30,343	27,262	435,667

Wampar LLG

Place	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	Total
Labu Tale			2,268	888	1,609	1,384			1,924	1,249			9,322
Labu Miti				68	592	841							1,501
Total			2,268	956	2,201	2,225			1,924	1,249			10,823

Source: Morobe Coastal Fisheries Development Program

Note: Figures may not be complete; also where data has been taken from multiple sources, the highest values has been used.

The tuna fishery has been a traditional fishery for village fishers along the Huon Coast for millennia, and has not until recently been specifically targeted as a commercial resource. This changed in 2000, when commercial long-liners (up to 20 vessels) began using the port of Lae as a base for their operations (including the aforementioned Maps Tuna). As mentioned above for Maps Tuna, due to the high price of fuel, lower prices for sashimi tuna in export markets, spiraling costs for air freight and difficult access to air freight opportunities, all these long-line operations have now ceased.

In 2004, a Filipino fishing company (but domestic-based), Frescomar-Seahelm Corp (hereafter Frabelle Tuna) set-up its fishing operations using purse-seiners to target tuna. In 2006, Frabelle Tuna also opened a cannery in Lae for the canning of tuna caught by its purse-seiners. In addition, it also opened a processing facility for tuna loins for export. Under its 'community obligation' program (part of a social equity program for being allowed to set-up and fish in PNG)

in 2005, Frabelle Tuna in conjunction with the Rural Development Bank (now the National Development Bank) gave pump-boats to selected fishing groups on lease-purchase arrangements, whereby fisher groups fish at FADs deployed by Frabelle Tuna, and land all their fish at the loining factory or cannery. There are approximately 50 FADs now located in the Huon Gulf ranging from 15-55 km offshore. Fisher group's fish with hand-lines and short long-lines primarily target yellow-fin and big-eye tuna. Associated by-catch includes marlins, dolphin fish and rainbow runners.

Loans for the pump-boats are approximately K 50,000/vessel. In discussions with the management of Frabelle Tuna, each pump-boat has to catch at least 2.1 t/mth to cover operational costs (1,800 kg ice at K 0.25/kg, 200 lt fuel at K 2.30/lt, rations at K 7.50/person/day for five crew) and loan repayment. In addition, the accompanying Filipino master-fisherman gets 25 % of all nett income. Unfortunately most vessels are not making this amount (Table 12, Figure 6). Additional costs to fisher groups also include the replacement of the ply-wood outer-skin of the pump-boat at a cost of approximately K 5,000/yr.

Table 12: Pump-boat fish landings (kg) by month

Month	Volume (kg)	No. of boats fishing	Average catch (kg)/boat
Aug-05	576	3	192
Sep-05	3,208	3	1,069
Oct-05	5,779	3	1,926
Nov-05	6,263	5	1,253
Dec-05	5,150	5	1,030
Jan-06	5,108	7	730
Feb-06	8,905	7	1,272
Mar-06	7,991	7	1,142
Apr-06	6,139	7	877
May-06	10,346	8	1,293
Jun-06	10,664	9	1,185
Jul-06	11,407	8	1,426
Aug-06	5,896	7	842
Sep-06	14,169	10	1,417
Oct-06	12,134	11	1,103
Nov-06	16,862	12	1,405
Dec-06	11,558	12	963
Jan-07	19,445	11	1,768
Feb-07	11,440	11	1,040
Mar-07	10,136	13	780
Apr-07	17,203	12	1,434
May-07	21,099	12	1,758

Source: Frabelle Tuna.

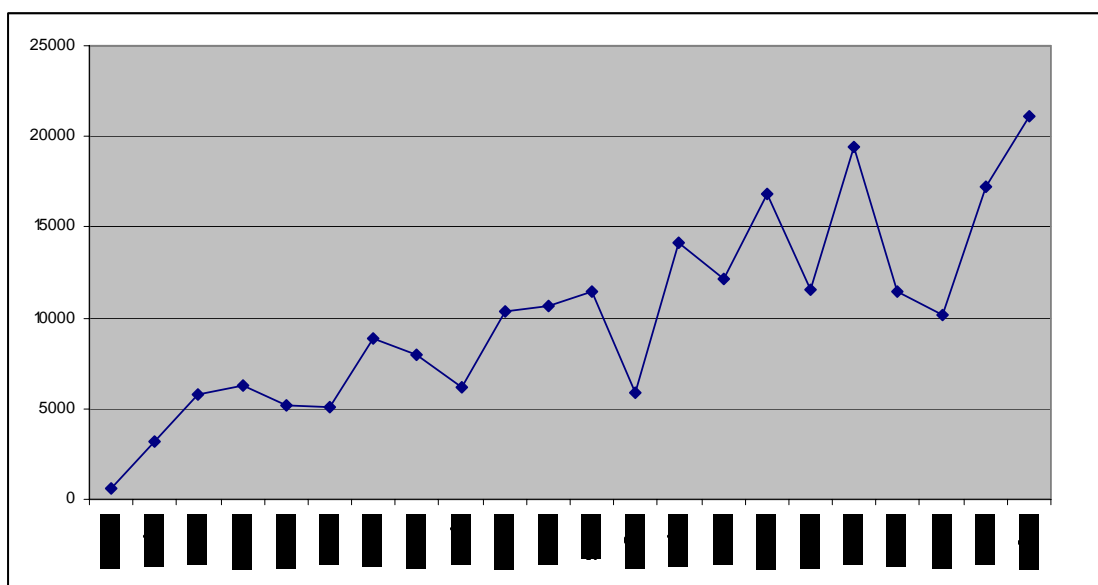


Figure 6: Average catch (kg)

Frabelle Tuna have now began implementing plans (utilising a carrier vessel and plans to have a dedicated vessel for ice-making) to increase the efficiency of the pump-boats as they would like to export four 20 ft containers/month, but can only produce one container/mth at present. To obtain this quantity of fish, Frabelle Tuna’s management projects that they would require 80 pump-boats fishing to fill the desired four containers.

There are three pump-boats fisher groups from the Huon Gulf District, two from the Morobe LLG area at Bosadi and Bau and one from the Wampar LLG area at Labu tale. The Hon Member for the Huon Gulf District, Sasa Zibe, would like to see every village along the Huon Coast with a pump-boat, but given the difficulties that the existing vessels are having with servicing their loans, this is probably not a feasible option. Currently, crew members are making roughly K 160/mth. There are also questions about the long-term sustainability of the tuna resources.

Frabelle Tuna currently buys tuna from the pump-boats at K 2.50-5/kg (Table 13) and estimate that approximately two-thirds of all catches are in the above 35 kg in weight category.

Table 13: Buying prices (K) for pelagic fish at Frabelle Tuna

Weight (kg)	Price (K)
> 35	5.00
15-34	4.00
<15	2.50

Source: Frabelle Tuna.

The European Union’s RCFDP also started in 2004 in the Morobe Province, whereby six fishing vessels were also given out under loan agreements through the Australian and New Zealand Bank. These vessels were to target a yet un-tapped resource, deep-water snapper. The original loan amounts were between K 136-138,000, but due to poor performance, the loan amount was later reduced by 30 % in late 2006 to K 95-96,000. There are three vessels in the Huon Gulf District, two in the Morobe LLG area at Kui and Bosadi, and one in the Salamaua LLG area at Busama.

The RCFDP fish landings began well enough with vessels landing reasonable quantities to the Private Sector Partner, Maps Tuna at the site of the Voco Point Fisheries Station. Landings quickly declined for a variety of reasons (Table 14, Figure 7) including high fuel prices, difficulties in accessing ice and lower than anticipated fish purchase prices from Maps Tuna.

Maps Tuna used to encourage buying program by advancing RCFDP fisher groups with money, though this practice quickly stopped as it became increasingly evident that fisher groups were selling more of their catch/purchases to the Papindo and other local supermarkets (estimated to be around 76 % of all fish landed). Recent advice from the RCFDP suggests that all vessels still in operation remain in arrears by 30-80 % of their loan repayments, even with the reduced loan subsidies.

Table 14: RCFDP fish landings (kg) by month

Month	Volume (kg)	No. of boats fishing	Average catch (kg)/boat
Aug-04	2	1,353	677
Sep-04	2	2,538	1,269
Oct-04	2	3,837	1,919
Nov-04	2	6,066	3,033
Dec-04	2	1,909	955
Jan-05	5	1,463	293
Feb-05	4	1,204	301
Mar-05	6	2,412	402
Apr-05	6	2,626	438
May-05	5	2,445	489
Jun-05	5	2,271	454
Jul-05	5	2,854	571
Aug-05	5	1,684	337
Sep-05	5	2,869	574
Oct-05	5	3,527	705
Nov-05	6	2,705	451
Dec-05	5	1,215	243

Source: Kinch, 2006.

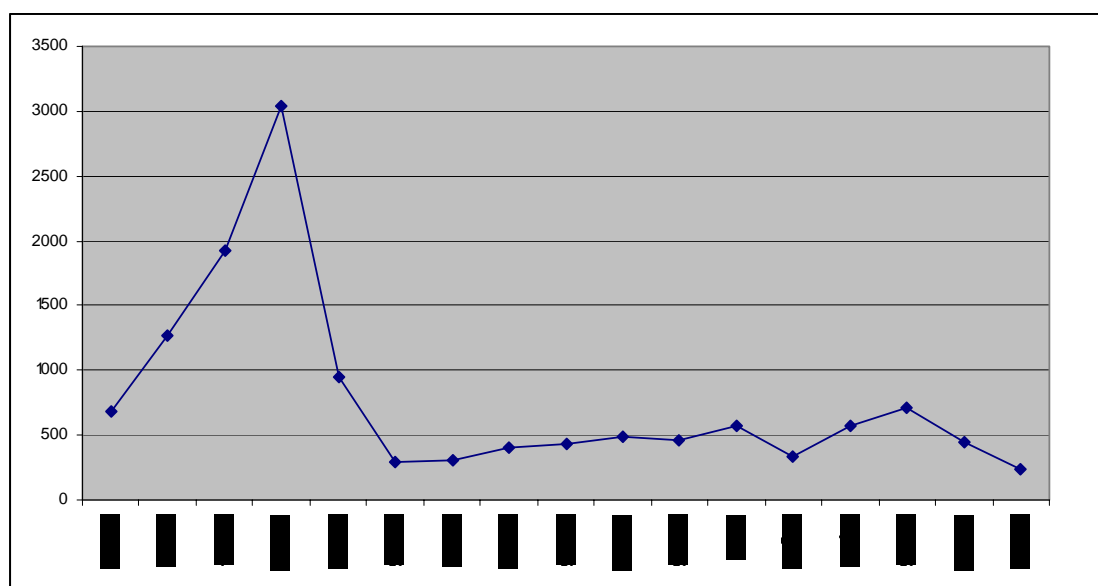


Figure 7: Average catch (kg)

In 2005, the CFMDP also started in the Morobe Province and has conducted community-based fisheries management awareness programs along the Huon Coast. One of the goals of the CFMDP was to explore arrangements through which communities might participate more fully in fisheries development and management in the Morobe Province in order to ensure that the benefits derived from marine resources were sustainably and economically beneficial over the long-term. The CFMDP has conducted awareness programs in most communities along the Huon Coast with 12 communities developing their own Community-based Fisheries Management Plans (Table 15). Another objective of the CFMDP was infrastructure development through a planned

wharf development at the location of the (old) Lae Yacht Club. This improvement was expected to create spin-off economic opportunities and social benefits for coastal communities in the Morobe Province. This development never went ahead because of severe siltation in the area and budgetary constraints.

Table 15: CFDMMP activities in the Salamaua and Morobe LLG areas

Salamaua LLG area	Awareness	CBFM Plan	Morobe LLG area	Awareness	CBFM Plan
Labu butu	✓	✓	Kui	✓	
Lutu Busama	✓		Siboma	✓	
Awasa Busama	✓		Paiawa	✓	
Buakap	✓	✓	Jigori	✓	
Asini	✓		Amoa	✓	
Laugui	✓		Bosadi	✓	✓
Laukanu	✓		Mou	✓	✓
Buansing	✓		Eware	✓	✓
Salus	✓		Sapa	✓	✓
Lababia	✓		Zaire	✓	
Buso	✓		Kobo	✓	✓
			Wainsoduna	✓	✓
			Bau	✓	✓
			Sowara	✓	✓
			Eia	✓	✓
			Gugumi	✓	✓

Source: Maremco Foundation.

There are several village fish buyers and fisher groups in various villages along the Huon Coast who buy or catch fish and sell in the market or to the Foodmart, Andersons and Papindo supermarkets. One fisher group/buyer from Buso, was observed during the source of the MLBA selling fish at Papindo. This group sold 145 kg of fish (from four days fishing and buying), consisting of 25 % rabbitfish, 25 % trevally (batfish), 45 % of mixed reef fish, 2 % lobster tails and 3 % tuna and earning K 1,379, of which K 525 was taken in direct costs for ice (K 40), fuel (K 360), kerosene (for night fishing, K 30), fishing equipment (K 20), transport (from the Aigris Market and back, K 55), and victuals (K 20). This group have also started a tradestore, fuel outlet and buying beche-de-mer, and have also started a beer store at Salamaua Point. They are selling fish once a week, and sometimes more. Advice from the management of Papindo state that this fisher group/buyer is their most regular supplier. Results of the CFMDP also show that fuel costs consume a large part of fishing expenses (Table 16).

Table 16: Fisheries expenditures by type – CFMDP survey of Huon Coast villages

Activity	% of households involved
Fuel	45.4
Gear	19.8
Ice	10.2
Rations	8.0
Stimulants	3.3
Bait	7.3
Crew	6.1

Source: National Fisheries Authority, 2007b.

Fisher groups buy fish from other fishers at approximately 40-50 % of the price that they sell to the supermarkets (Table 17). A review of sales receipts held by village buyers showed that reef fish consistently provided around 70 % of weight and cash value for all fish purchased. Supermarkets in turn, retail the fish that they have purchased off these fisher groups for approximately 100 % mark-up or more, selling for between K 10-17.75/kg.

Table 17: Buying prices for village fish buyers and the Papindo buying centre

Species	Village buyer (K)	Papindo buying centre (K)
Lobster	6.00	16.00
Red emperor	3.50	8.00
Mixed reef fish (including rabbitfish)	3.50	7.50
Mackerel	3.50	5.50
Trevally (batfish)	2.50	5.50
Tuna (and other pelagics)	2.50	4.00-6.00
Squid	0.50	1.50

Source: Village buyers and Papindo.

The main impediment to sustained fisheries development in the Huon Gulf District has been the lack of adequate facilities to keep fish fresh during transport to Lae and poor management of finances by fisher groups and buyers. Additionally, increasing transport costs, limited access to fishing grounds (i.e. reefs), possible over-fishing of beach areas (by beach seine) and unfavourable catch composition are problems.

Communities have reported that they would respond more positively if there was more bait availability (which could be alleviated by community FADs), a regular supply of ice and better storage at the village, and an organized transport facility for marketing (which would alleviate the need to run to Lae on a frequent basis).

The current premises at the Voco Point Fisheries Station (where Maps Tuna has been operating) is now up for tendered. There are opportunities to re-establish a fish buying business here, as is the rehabilitation of the fisheries station at Morobe Station under a suitable business entity. This would have immediate economic impacts on rural communities in the Salamaua and Morobe LLG areas, particularly when combined with a regular shipping service. There are marketing opportunities in the Highlands (already Papindo ships excess fish to its sister supermarkets in other provinces).

Other Fisheries

The harvesting of other commercial marine resources (beche-de-mer, trochus and sharkfin) from the Huon Coast is thought to be minimal. Villages along the Huon Coast could be supplying approximately 5-10 % of all beche-de-mer and trochus exports from the Morobe Province (Tables 18 and 19). Figures supplied by Asiapac show a total of 3,111 kg of beche-de-mer has been purchased from the Huon Gulf District, and just over 2 t of trochus. Advice provided by Papindo suggests that their beche-de-mer purchases from the Huon Gulf District are around 200-300kg/yr, mostly of poor quality and usually B and C grade.

Table 18: Dried marine resources purchases (kg) from the Huon Coast by Asiapac Ltd: 2007

Month	Beche-de-mer (kg)	Trochus (kg)	Sharkfin (kg)
January	47	190	2
February	347	131	7
March	608	279	9
April	623	821	20
May	633	558	4
June	853	120	3
Total	3,111	2,099	45

Source: Asiapac.

Table 19: Dried marine resource exports (kg and K) from the Morobe Province: 1999-2005

Month	Beche-de-mer		Trochus		Sharkfin	
	Volume (kg)	Value (K)	Volume (kg)	Value (K)	Volume (kg)	Value (K)
1999	13,450	224,510.00	3,480	41,440.00	6,090	758,630.00
2000	30,930	62,870.00	7,590	75,420.00	4,840	818,620.00
2001	45,090	1,447,760.00	5,560	30,610.00	2,970	587,040.00
2002	3,840	230,720.00	2,840	19,500.00	1,230	279,030.00
2003	16,330	553,980.00	14,000	87,330.00	2,460	568,790.00
2004	17,390	644,210.00	13,400	91,580.00	1,330	280,160.00
2005	29,820	985,040.00	18,920	140,780.00	400	77,980.00

Source: National Fisheries Authority, 2007c. *Note: The high volume of sharkfin exports in the early-2000s is due to by-catch by tuna long-liners based out of the port of Lae.

Beche-de-mer does command a high buying price (Table 20), but the Huon Coast lacks suitable habitat for these fisheries to be expanded.

Table : Beche-de-mer buying prices at Papindo - 2007

Species	Grade A	Grade B	Grade C	All Grades
Sandfish	120.00	90.00	50.00	
White teatfish	90.00	75.00	40.00	
Black teatfish	65.00	45.00	35.00	
Stonefish	55.00	45.00	35.00	
Surf redfish	55.00	45.00	35.00	
Blackfish	55.00	45.00	35.00	
Prickly redfish	60.00	45.00	35.00	
Greenfish	60.00	45.00	35.00	
Curryfish	45.00	35.00	25.00	
Tigerfish	25.00	20.00	15.00	
Brown sandfish	20.00	15.00	10.00	
Amberfish				10.00
Elephant trunkfish				10.00
Lollyfish				10.00
Chalkfish				10.00
Snakefish				10.00
Pinkfish				10.00
Flowerfish				10.00

Source: Papindo.

Shellfish is commonly sold from the communities bordering the Labu lakes and swamps in the Lae Main Market. Shellfish accounted for 62 % of all seafood sold during the recent 12-month survey of the Lae Main Market by the CFMDP. Both fresh-water and marine prawns are caught by small seine or scoop nets and are consumed or sold in local markets along the Huon Coast. Prawns and crabs caught from the Labu Estuary are regularly sold at the Lae Main Market or occasionally at the Papindo buying centre.

Fish Farming

Fish farming has been conducted in the Morobe Province since the 1950s. Tilapia is the main species grown by farmers within the Huon Gulf District, with the majority of farmers located in the Wampar LLG area (scattered around the Potsi, Pusika, Wampup, Nadzab and Gabsukeg areas), with farmers having between 1-6 ponds. Genetically enhanced tilapia (*Tilapia nilotica*) was introduced in 1999 from the Philippines.

It is currently not known how many fish farmers are in the Huon Gulf District, but it estimated by DAL to be in the thousands. The Potsi Inland Fish Farmers Co-operative (PIFFC) in the Wampar LLG area currently has 74 farmers, with most farmers having one pond, some with two or more. Fish produced by the PIFFC are sold for K 5/kg at local markets and fingerlings are sold to other farmers for K 0.50/each. There are also a group of 15-20 fish farmers in the Malalo Station area (Tabula, Yemli, Dule and Kaiwa) with 2-3 ponds each (extension services for this group are

provided by the aquaculture extension office of the Lutheran Development Service). This fisher group have been bringing their fish down to Buakap and then selling them in Lae. A co-ordinated transport service would assist them in selling fresh fish rather than smoked.

At present all tilapia fingerlings need to be flown down from Aiyura in the highlands (with an average of 20 shipments/yr). A hatchery is now under construction at the DAL facility at Erap. Advice from DAL suggests that there is a current demand for 40,000 fingerlings/mth, but at present they can only supply 6,000 fingerlings/mth on an irregular basis as they have to come from Aiyura. Once this hatchery is operational, DAL suggests that they will be able to supply up to 200,000 fingerlings/mth selling at K 0.20-0.30/each. Other species suitable for pond culture include carp (*Cyprinus carpio*), eels and trout (*Oncorhynchus mykiss*). Eels are currently selling at local markets for K 1-5/each.

Tilapia is usually stocked at 1-2 fish/m² with higher densities possible with supplementary feeding. NARI has recently completed a program and produced formulas for making fish feed at the village level via the use of mini-feed mills (these are available at Project Support Services Ltd in Lae).

DAL has recently conducted a market survey amongst supermarkets and institutions with large boarding populations to determine the viability of marketing farmed fish. The response has been favourable with one meat supplier requesting 2 t/mth and is willing to pay K 8/kg. During the recent 12-month survey by the CFMDP at the Lae Main Market, tilapia was the most common fish sold, so production would meet demand.

Pelgans has a hatchery and grow-out facility (they have eight ponds measuring 50 x 100 m) at Singawa in the Nawaeb District. Fish produced from this farm are sold through their supermarket outlets for K 8.50/kg. Mainland Holdings also had a tilapia hatchery and farm located at their crocodile farm at 9-mile, just outside of Lae. This farm never went into production. Advice from the manager states that Mainland Holdings is now no longer interested in tilapia farming as it has 47,000 crocodiles to look after.

The NFA has recently earmarked an additional K10 million for lending to inland fishery projects nationwide to be dispensed by the National Development Bank under a credit scheme. The lending program is to be piloted in the Morobe Province.

The marine prawn *Penaeus monodon* (and other *Penaeus* spp.) is naturally present in the lakes and lagoons in the coastal areas of the Huon Gulf District. These species of prawns can be cage cultured, producing a high-quality product, with low levels of environmental impacts. They also do not need supplementary feeding at low densities. Juveniles (0.5g – 10g body weight) can be relatively easily caught by seine net from shallow sea-grass beds and appear to be abundant at all times of the year

Within PNG, there is a strong domestic-market demand for prawns. Papindo currently buys for K 16/kg. Villagers already catch and sell prawns of all sizes (including small juveniles) at local markets and in Lae. Reserving these juveniles for on-growing in cages thus has great potential for value-adding in this artisanal prawn fishery.

Salus Lake, Sappa Lagoon and Bau Lake could all be viable places for cage culture, given their sheltered nature and stable salinity. DAL conducted a survey last year of Lake Pipi in the Labu area, but concluded that this lake was too shallow. Cage culture in the Labu lakes was trailed in the early 1980s, whereby, wild culture of mullet (*Liza Macropelis*) was conducted using fingerlings (3-10 cm) caught by small nets. This project was technically feasible but suffered from social problems within different family groups which led to exclusion and poaching. The project was finally closed when flooding from the Markham River destroyed the floating cages.

Other fish trialled included *Tilapia mossambica*, milkfish (*Chanos chano*), trevally (*Caranx ignobilis*) and catfish. Milkfish (*Chanos chanos*) is cultured in many Asia and Pacific countries and is suitable for smallholder cage and pond production. Fry can easily be caught using a wide variety of nets and transferred to cages or ponds for grow-out.

Eco-tourism

The Morobe Province attracts small numbers of tourists annually. In 2006, the Morobe Province received 3,557 business visitors (62 % of total visitors) and 2,168 holiday visitors (38 %). These figures are only for international visitors and do not take into consideration domestic tourists.

The tourism industry in the Morobe Province is noted as under developed but with some potential. There are already a number of guesthouses established in the Huon Gulf District (Table 20), one is commercially orientated, located at 12-mile outside of Lae, while the others were projects developed by the VDT. In discussions with VDT and Morobe Tourism, there is no data on occupancy rates for the guesthouses in the Salamaua and Morobe LLG areas. Most visitations by VDT controlled guesthouses are by VDT staff themselves, or in the case of the Kamiali Guesthouse by NGOs. Japanese tourists visit the Waria Valley under VDT's Eco-home Habitat Program on a relatively regular basis. It has been estimated that during 2000-2003 more than 200 foreign tourists visited the Salamaua LLG area (it is probable that a high number of these were guests of expatriates who own holiday houses at Salamaua).

The Huon Gulf District does offer certain attractions that would be of interest to tourists including bird watching (at Gabensis in the Wampar LLG area), canoeing and rafting (currently offered along the Erap River by Momahi Tours), caving, cultural experiences, diving (and snorkeling), leatherback turtle watching, trekking, World War II interests, natural attractions such as islands and waterfalls.

There is increasing interest in the Black Cat and Skin Diwai trails as alternatives to the increasingly popular (and crowded) Kokoda Trail. The Black Cat trail is still a raw track with areas needing improvements, it starts at the Black Cat Pass and follows the headwaters of the Bitoi River down to Godogasul/Wapali, then on to Mubo, New Camp and Kamiatam before arriving in Salamaua (you can also raft the last section from Kamiatam down the river to Nuknuk and then walk along the beach to Salamaua). The Skin Diwai trail is a less strenuous walk that follows the Buisaval River to Wapali and then follows the same trail as the Black Cat to Salamaua. Approximately 50 trekkers have used this route in the last 18 months and takes roughly four days to do the walk. Guides are paid approximately K 60/day, while porters earn around K 50/day. Each trekker also pays a one-off K 50 track fee. There is also the option of splitting the trail at either Godogasul or Mubo and heading down to the coastal villages of Lababia (where the Kamiali Guesthouse is located) or Salus. The promotion of these trails would benefit from having better organisation (particularly with the allocation of guides from differing villages) and suitable radio communications. Accommodation in Wau, the starting point costs K 125/night with Dona Enterprises, or K 85/night at the Wau Ecology Institute. Along the trails there are camping areas at K 5/person and a few guesthouses (these also needs better organisation) ranging from K 10-20/person. Bush stops are uncharged.

Eco-tourism should only be promoted for the Salamaua LLG area, where existing infrastructure exists, attractions are readily available and the distance is not too far from Lae.

Table 20: Guesthouses and accommodation prices in the Huon Gulf District

Guesthouse	Place	Price (K)	Type	
Bula Falls Guesthouse	Gwado	45	Accommodation and meals	Bungalow or standard room
Kamiali Guesthouse	Lababia	80	Accommodation and meals	Bungalow or open dormitory
Nanga Arts Centre and Guesthouse	Pema	50	Accommodation only	Standard room
Popoe Guest House		50	Accommodation and meals	Standard room
Salamaua Haus Kibung	Salamaua	22	Bungalow accommodation only	Bungalow
		66	Guesthouse accommodation only	Standard room
Tulip Guesthouse	Bau	50	Accommodation only	Standard room
Unu Resources Centre Guesthouse	Unu	50	Accommodation and meals	Standard room
Momahi Tours and Guesthouse	12-mile	97 (116)	Accommodation (bed and breakfast)	Family room
		64 (83)	Accommodation (bed and breakfast)	Garden room
		83 (102)	Accommodation (bed and breakfast)	Highway room
		49 (68)	Accommodation (bed and breakfast)	Single transit room
		70 (89)	Accommodation (bed and breakfast)	Twin transit room
		211 (230)	Accommodation (bed and breakfast)	Mountainview suite

Source: Village Development Trust and Morobe Tourism.

Livestock

The Morobe Province is the most important beef-producing region in PNG. During the 1970s smallholder cattle in the Markham Valley was estimated to be around 10,200 head. There has been a decline in cattle numbers over the past 20 years due to land disputes, poor management and low prices (due to poor transport infrastructure), benefit distribution, lack of markets and market access and competition from sheep and poultry. Most cattle now seen in the Markham Valley belong to either Ramu Sugar or Trukai Industries.

Trukai Industries currently assists smallholder producers through an out-grower system that facilitates the marketing of cattle from these producers. Trukai Industries also supplies bulls free of charge to smallholders.

Advice from the beef production manager at Trukai Industries suggests that there are approximately 100 smallholder producers (the smallest has five cows) in the Wampar LLG area. Trukai Industries purchase approximately 2,000 head of cattle/yr from these smallholders (picked up free of charge). Buying prices are K 3/kg for prime cattle and K 2/kg for other cattle. Cattle are bought at any size by Trukai Industries and are then left to grow or gain condition (growth rate is estimated at 1.2-1.5 kg/day).

The beef cattle industry is in need of a cost effective and modern slaughtering infrastructure to enable local producers to compete with overseas producers who supply PNG with low priced cuts for canning and to enable local producers to supply meat at competitive prices due to economies of scale (domestic meat consumption of beef is around 20 % with sheep and poultry meat equally sharing the remainder). Retailers influence meat availability to consumers by switching to the cheapest sources and cuts of meat, due to the low purchasing power of most people in PNG.

Trukai Industries sells between 65-85 head of cattle/wk (usually over 400 kg/each) to the local abattoirs each Monday for local markets. The local abattoir has been mooted for sale, which would severely affect the smallholder cattle industry. Trukai Industries has suggested that a multi-species abattoir be established at Erap which could process cattle, pigs, horses, camels and

goats (there is a huge export demand for goats in the Middle East, Malaysia and Indonesia, and goats are ideal for smallholders).

Because there is no export standard abattoir, Trukai Industries has since 2001 been involved in live cattle exports to the Philippines. Because live exports have a set price floor (if local prices for slaughter do not match export prices then cattle are exported) this has led to a significant increase in prices paid to all cattle producers and as a result there has been an upsurge of interest in cattle production by smallholders. Strengths of PNG beef that it is disease free with no Bovine Spongiform Encephalopathy present.

The Chairman of Bris Kanda (who is also the Agribusiness Manager for Trukai Industries) notes that there is massive 'potential' to increase smallholder production of cattle, though there are also several constraints to this, which include land disputes, small land sizes for running cattle, high set-up costs (fencing, water, yards and purchase of foundation stocks), a lack of animal health supplies, the need to improve pastures, poor transport infrastructure, law and order, loss of calves to dogs, lack of participation amount industry and competition from other meats (Indian Buffalo).

The DAL at Erap in the Wampar LLG area is currently encouraging villagers to take up smaller and easy to handle animals to generate income and assist in nutrition, such as rabbits (selling for K 22/animal and taking 3-4 months to saleable size) and goats. DAL has an active goat dispersal program at Situm in the Nawaeb District, with the concept of three weaned kids given to the next lot of farmers. Goats are small animals that can be managed easily by all family members and adaptable to village lifestyles. They are not expensive to manage and are able to do well on lower quality feeds and do not require improved pastures.

Poultry Farming

Poultry farming has become a big success in the Wampar LLG area, with village producers acting as out-growers with Niugini Tablebirds Ltd. The total number of farmers contracted to growing chickens for Niugini Tablebirds in the Wampar LLG area (covering 10-Mile, along the Highlands Highway to as far as Nadzab Airport, Gabensis Village and back to Labu Pile area) is approximately 135 growers. These smallholder producers are growing about 800,000 chickens/yr.

Tablebirds state that there is room for expansion for new growers and also improvement to others to build permanent buildings to replace old bush materials buildings that are falling apart. In discussions with some smallholders they stated that they would increase production if the costs, especially feed and day-old chicks were reduced, and more credit facilities were available. Chicks are sold to the smallholder for K 1.50/each. Farm sizes range from 2,000-9,000 chickens at a time. Feed for the chickens is around K 50-55/bag (40 kg). Mortality rates range between 2-5 %/batch. Niugini Tablebirds provide all inputs which are deducted at the time of sale. Chickens are purchased from the smallholder on kg rate over a set weight. Advice from farmers that normally grow between 3,000-4,000 chickens/batch suggest that they can make between K 1,000-K 1,500/batch with 4-5 batches/yr.

Unlike broiler chickens where farmers raise them under intensive systems and feed them with commercial feeds primarily for sale, village chickens are kept for various reasons, including home consumption, for sale and for social and traditional obligations such as bride price.

Village poultry production under free ranging system is very low regardless of several attempts in the 1970-1980s to improve production. Under the recent Testing and Delivering of Technologies to Improve Village Chicken Production by NARI (funded by AusAID) a pilot scheme was established at improving village poultry production by 10-20 % in the Morobe LLG area. Surveys conducted in the Morobe LLG area showed that most households kept approximately 12 chickens/household, with 48 % of all households keeping chickens. The main production

constraints are predators, theft and disease. Of all village poultry farmers surveyed during the study, approximately 85 % of them sold their chickens at K 6-10/chicken. A needs survey was also conducted with 50 % of all farmers wanting training on book-keeping and savings.

Crocodiles

Mainland Holdings Ltd produce crocodiles for the production of high-grade crocodile skins for export to the lucrative international leather market, and currently have approximately 47,000 crocodiles currently in production.

There is very limited wild harvest of crocodiles from the Huon Gulf District. Advice from the manager of the crocodile farm suggested that approximately 10 crocodile skins/month from hunters in the Huon Gulf District. Crocodile skins do command a good price depending on size and grade (Table 21).

Table 21: Buying prices (K) for crocodile skins by Mainland Holdings Ltd

Size (cm – belly-width)	Grade 1 (K)	Grade 2 (K)	Grade 3 (K)	Grade 4 (K)
18	63.00	32.00	22.00	11.00
19	74.00	37.00	27.00	14.00
20	85.00	42.00	30.00	15.00
21	126.00	65.00	32.00	16.00
22	150.00	75.00	38.00	19.00
23	155.00	80.00	40.00	20.00
24	162.00	85.00	43.00	22.00
25	170.00	90.00	45.00	24.00
26	320.00	160.00	80.00	40.00
27	330.00	165.00	82.00	41.00
28	345.00	172.00	86.00	43.00
29	355.00	180.00	90.00	45.00
30	365.00	185.00	92.00	47.00
31	382.00	191.00	95.00	48.00
32	394.00	196.00	98.00	49.00
33	403.00	201.00	100.00	30.00
34	417.00	208.00	104.00	52.00
35	430.00	213.00	107.00	53.00
36	441.00	220.00	110.00	55.00
37	451.00	225.00	113.00	56.00
38	465.00	232.00	116.00	58.00
40	478.00	239.00	119.00	60.00
41	502.00	250.00	125.00	62.00
42	515.00	258.00	129.00	64.00
43	529.00	264.00	132.00	66.00
44	537.00	268.00	134.00	67.00
45	551.00	275.00	137.00	68.00
46	561.00	280.00	140.00	70.00
47	575.00	287.00	144.00	72.00
48	588.00	294.00	147.00	73.00
49	601.00	300.00	150.00	75.00
50	612.00	306.00	153.00	76.00
51	625.00	312.00	156.00	78.00

Source: Mainland Holdings.

Eco-forestry

There has been considerable commercial logging over the last 30 years throughout the Huon Gulf District. In the 1990s, the VDT (under their Eco-forestry Department) with support from the WWF, began introducing portable sawmills throughout the Huon Gulf District as alternative livelihood and development projects for communities in preference to commercial logging, with the VDT buying eco-timber from the villagers for resale and export. Such operations were not seen by the villagers themselves as an alternative to the income generated from large-scale logging companies.

Since portable sawmills were not commercially viable, the focus of their use became cutting timber for local sale and use, or assisting in community important projects. Portable sawmills have been used by the VDT to construct several village guesthouses including the Tulip Guesthouse in Bau in the Morobe LLG area, and the Kamiali Training Centre and Guesthouse and the Bula Falls Guesthouse at Gwado in the Salamaua LLG area. Recently VDT delivered a portable sawmill to Labu miti so they could cut timber for the construction of a new school.

Initially, the VDT concentrated efforts on providing mills as gifts or providing a substantial portion of the capital required to purchasing portable sawmills, with little thought given to the practical location of the mills (in some cases causing land disputes), access to markets and the need to satisfy buyers by attention to quality of product (problems included the inclusion of sapwood and juvenile heartwood, improper drying causing cracking or no drying at all, undercutting timber and irregular cutting, ends not properly sealed, uneven thicknesses, and short lengths) and consistency of supply. Another factor that contributed to failure was the high expectations of the people to receive higher income from small-scale operations (there was no incentive for people to operate the portable sawmills commercially because the capital costs had been initially donated and thus the necessity to provide consistent production to service a loan was not present). Others costs such as labour required to move processed timber from the bush to the point of sale was also never taken into consideration.

Of the five portable sawmills that were in operation during the 1990s, and which claimed eco-forestry status for export, all of them operated only when materials were required, and were thus not commercial ventures and were not organised in a way which would make them commercially viable.

Recently in discussions with the Hon Member for the Huon Gulf, Sasa Zibe, he stated that eco-forestry projects should only be developed for community important buildings, housing programs and 'save and build' concepts.

Commercially valuable timbers found in the Huon Gulf District are listed in Table 22.

Table 22: Commercial valuable trees found in the Huon Gulf District

Botanical Name	Common Name
<i>Palaquim spp.</i>	Pencil cedar
<i>Pometia pinnata</i>	Taun
<i>Intsia bajuga</i>	Kwila
<i>Pterocarpus indicus</i>	Rosewood
<i>Dracontomelon dao</i>	Walnut
<i>Terminalia spp.</i>	Y/B Terminalia
<i>Anthocephalus spp.</i>	Yellow hardwood
<i>Vitex quinata</i>	Garamut
<i>Aglaiia cuculata</i>	Amoora
<i>Endospermum medullosum</i>	Erima
<i>Celtis nyanil</i>	Celtis
<i>Anisoptera</i>	Mersawa
<i>Findersia</i>	Silkwood
<i>Albizia</i>	White Albizia
<i>Elaeocarpus</i>	Quandong
<i>Octomeles</i>	Erima
<i>Canarium</i>	Canarium
<i>Cinnamomum</i>	Camphorwood
<i>Planchonia papuana</i>	Planchonia
<i>Athrocarpus spp.</i>	Arthocarpus
<i>Dysoxylum spp.</i>	Dysox
<i>Cananaga odorata</i>	Cananaga
<i>Neonauclea</i>	Neoclea
<i>Bischofia javanica</i>	Java cedar
<i>Myristica spp.</i>	Nutmeg
<i>Hybiscus papuadendron</i>	Bulolo ash
<i>Sloanea spp.</i>	Sloanea
<i>Alstonia scholaris</i>	Milky pine
<i>Litsea spp.</i>	Litsea
<i>Sterculia schumaniana</i>	Sterculia
<i>Maxitixidendron spp.</i>	Garagaro
<i>Suzygium spp.</i>	Water gum
<i>Buchannia molis</i>	Buchannia
<i>Neuburgia corrinocarpa</i>	Neuburgia
<i>Pimeleodendron</i>	Pimeleodendron

Source: Martin, 1996.

Gold

Advice from one gold buyer in Lae suggested that they receives on average 100 people/mth from the Waria Valley region in the Morobe LLG area and approximately 20 people/mth from the Salamaua LLG area selling between 10-20 gr/person. The current buying price is K 30-36/gr which is on-sold for selling at K 52.60/gr. Gold pans retail for K 30-35/each, mini-dredges from K 18-20,000 and concentrators from K 2,500-2,750.

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