Australian Government

Australian Centre for International Agricultural Research

Final report

project	**Evaluating domestic tuna fisheries projects**

Contents

1   Acknowledgments

Many people contributed to the work of this project and their contributions are gratefully acknowledged in footnotes to the project publications which are available on the Project Website: www.uq.edu.au/economics/tuna.

2 Executive summary

While Papua New Guinea has substantial stocks of tuna within its Exclusive Economic Zone, the annual sustainable catch from these resources has probably already been achieved. Further development of the tuna fishery will take the form of a change in the balance between the longline and purse seine fisheries, or a change in the allocation of the purse seine catch. PNG has adopted a policy of domestication of its tuna fishery, which involves encouraging domestic longline vessels and expanding the proportion of the purse seine catch taken by locally based vessels supplying domestic canneries. As locally based purse seiners displace the purse seine fleets of distant water fishing nations the level of access fees paid by the latter will decline. Lower access fees are a real cost to PNG and it is important to ensure that the domestic operations which replace those fleets generate at least corresponding benefits for the host nation.

Many foreign companies have expressed interest in setting up tuna processing operations in PNG. At the time the Project was conceived, two plants were in operation with several others proposed. Staff at the National Fisheries Authority needed help in developing and applying a method of analysing the economic benefits and costs to PNG of competing proposals. Other countries in the Pacific Islands region were facing similar issues and staff at the Forum Fisheries Agency indicated that they would also like to be involved in the project.

The objective of the project was to develop a benefit-cost model that could be applied to proposals for domestic development of the tuna industry in order to calculate the full range of benefits and costs of any proposed development by a foreign firm. The methodology of a spreadsheet based benefit-cost model had already been developed by Campbell and Brown (2003) and the aim of the project was to gather the data required to apply this model to the analysis of an established cannery in Madang, PNG, as a case study. The case study would then serve as a template for analysis of proposed processing projects in the region.

Estimates of a range of shadow-prices required to measure the opportunity cost to PNG of the resources, principally fish stocks and labour, it contributes to a domestic tuna processing operation were generated. A large sample survey of the domestic labour force in the Madang cannery was undertaken with the cooperation of the company and a great deal of data about employees' personal and employment characteristics was collected and analysed to determine the shadow-price of labour. The data were also used to determine the effect of level of education on labour productivity in the cannery.

Shadow-prices of tuna catches, foreign exchange, public funds, environmental costs and locally provided services were also considered. The results were incorporated in a spreadsheet benefit-cost analysis using the method developed by Campbell and Brown which emphasises the net benefits to the host country. A member of the FFA staff undertook a similar analysis of a proposed tuna cannery in the Solomon Islands.

The benefit-cost model details and measures the range of benefits and costs which the host country could expect to flow from a domestic tuna cannery. Since the model also measures the net benefit to the foreign firm under a range of possible financial arrangements, it can be used as a tool in negotiating any tax or similar concessions requested by the firm. Since partner country staff were fully involved in the survey work at the cannery and the subsequent development of the model they are able to apply it to new proposals as they come forward. Working on the project has also improved the general level of understanding about the range and size of the benefits and costs of domestication to the countries of the region. The model and its results are available to fishery analysts throughout the region at: www.uq.edu.au/economics/tuna.

3   Background

This project was conceived as a complementary outcome from the implementation of a previous ACIAR funded project titled The Economics of PNG Tuna Fisheries (ACIAR Project 8928) which dealt with the period 1988 to 1994. This study evaluated the major aspects of the domestic tuna industry and assessed the major variables relevant to its development. The actual level of new fisheries investment and development was very low during the period examined but the ACIAR project helped create the basis for establishing new investments. The fisheries administration was restructured with the establishment of the National Fisheries Authority (NFA) in 2000 and reorganization of the industry. With the removal of industry investment impediments there was a general increased investor interest in the harvesting and processing sectors of the industry.

The establishment of domestic tuna development in the sector by foreign investors and enactment of a Government 1995 Tuna Domestication Policy prompted a significant interest in new fisheries investments. In the processing sector two canneries (tuna and mackerel) were established in Madang and Lae after 1995 with a degree of Government subsidy to facilitate the creation of an industrial base for the fishing industry in the country. Attracting such investment with subsidies has created distortions in the local economy and questionable real net benefits to the PNG economy. The industry was experiencing a significant increase in interest from potential investors in harvesting (number of fishing vessels) and processing (loining and canning plants) over the period leading up to the project The encouragement of new investment via subsidy needs to evaluated, since, as additional national companies enter the industry they desire similar waivers of duties on imported fishing vessels and fishing gear and rebates on fuel. There was perceived to be a requirement for detailed benefit /cost evaluations of these new investments within an appropriate policy framework.

The project built on earlier projects dealing with the region's tuna fisheries. ACIAR Project 8928 dealt with a range of economic questions about PNG's tuna fisheries, mainly relating to purse seine, longline and pole-and-line harvesting operations, but including a small study of the financial viability of a regional cannery (Landu et al. (1994)). ACIAR Project 9405 took a regional approach and calculated the appropriate balance between these different types of operations in the Western and Central Pacific Ocean tuna fisheries. A further development of Project 9405 (Project ASEM/2001/036) aimed at working out areas of potential agreement between the resource owners and the distant water fishing nations (DWFNs) which would allocate the catch among gear types and between the foreign and domestic operations in a way which maximizes the benefit to the Pacific Island Nations. These earlier projects provided valuable information about the opportunity cost of domestic exploitation of the tuna resource. However, with the exception of the Landu et al. (1994) study, they did not deal with domestic processing, which is the main focus of the current study because of the potential indirect benefits to the PNG economy. While a useful starting point, the Landu et al. (1994) study of a regional cannery took a simplified approach, focussing mainly on financial viability rather than domestic net benefits, and lacked a structure of analysis which could readily be generalized.

To obtain full value from its tuna fisheries PNG needs to achieve the appropriate balance between foreign and domestic exploitation. On the one hand, authors such as Munro (1985) argue that a modern industrial fishing industry is capital and skill intensive and that, given the relative endowments of developing and developed economies, the distant water fishing nations have a comparative advantage in the fishery. This argument suggests that the appropriate strategy for PNG is to use its fishery to generate access fees from DWFNs. On the other hand, authors such as McCoy and Gillett (1997) argue that domestication of the tuna fishery will potentially generate employment benefits, technology transfer and forward and backward linkages which will promote economic development. This argument suggests that PNG should consider operating its own

harvesting and processing facilities. Both arguments have some validity and the issue for a developing country, such as PNG, is to find the appropriate balance between domestic and international operations.

As noted above, PNG was promoting the domestication of its tuna fishery and needed assistance in determining which industry operations should be based in PNG and which overseas. At the time the Project was being considered only 25,000 tonnes of catch was being processed annually in PNG but there were proposals to increase this amount to over 100,000 tonnes, which represents a significant proportion of the sustainable tuna purse seine catch from PNG's EEZ. The National Fisheries Authority (NFA) was regularly receiving proposals to establish domestic processing and harvesting facilities conditional on access to PNG's tuna resources. However, since some species of tuna (yellowfin, bigeye and albacore) are regarded as currently fully exploited, catches by new domestic operations would have to be offset, at least to some extent, by reduced catches by DWFNs, with the consequent reduction in access fee revenues.

The NFA needed a methodology for evaluating the contribution of proposed investments in the domestic tuna industry to the PNG economy. This methodology would take account of the benefits – principally tax revenues and employment benefits – and the costs – principally the opportunity cost of the proposed tuna catch, but also the costs of the concessions which are sometimes offered to induce a foreign company to locate in PNG. Cost-benefit analysis is the logical tool to employ in this evaluative process. Recent developments in the application of benefit-cost analysis (see Campbell and Brown (2003)) provide for a breakdown of project net benefits between the private and public sector, and between PNG and the foreign investor. This approach also provides for the necessary corrections, for the purposes of the analysis, to market prices of critical inputs or outputs such as tuna, labour, foreign exchange, and public funds. The benefit-cost approach also provides a detailed breakdown of net benefits to PNG – tax and tariff revenues, unemployment benefits, benefits to local business etc.

Benefit-cost analysis is regularly employed by consultants hired on an *ad hoc* basis to report on proposed investment projects. However these reports vary significantly in approach and reliability, making it hard for NFA officials to use them in decision-making. The adoption of a comprehensive standardized approach would make it easier to compare projects in terms of their net benefits to PNG and to ensure that the domestication of the industry proceeds in the most advantageous way.

In order to develop a standardized approach the project undertook a case study of a large representative project: this is a project located in Madang which involves domestic harvesting and processing, with significant foreign investment. The benefit-cost analysis was to be conducted within the spreadsheet framework developed by Campbell and Brown (2003). Use of this framework ensured that the analysis could serve as a template for evaluation of subsequent project proposals. In addition the information obtained about project specifications and the project's tariff, indirect and direct tax contributions would be applicable to other fishery projects. The study was also to estimate shadow-prices for labour, foreign exchange and public funds which could be used in benefit-cost analysis of projects in all sectors of the PNG economy. The results of the study would also be relevant to evaluating foreign investment in the fishing industry in other Pacific Island Nations.

4   Objectives

The tuna fisheries in PNG's Exclusive Economic Zone (EEZ) are exploited largely by distant water fishing nations (DWFNs), with the economic return to PNG taking the form of access fees, which currently constitute around 2% of annual government revenues. PNG has adopted a policy of gradually domesticating the tuna industry in order to obtain a wider range of returns, such as employment benefits. Since the tuna catch is currently around the maximum sustainable level, implementation of this policy involves replacing DWFN activity with a series of domestic projects. An appropriate evaluative framework was required by the National Fisheries Authority (NFA) to ensure that the projects which replace DWFN operations confer a net benefit on the PNG economy.

A comprehensive spreadsheet-based framework for project appraisal which can be generalized to a wide range of projects has recently been developed (Campbell and Brown (2003)). This framework was to be applied to a large tuna harvesting and processing operation in Madang to calculate the benefits of the project to the economy, net of the opportunity costs. In the course of the analysis shadow-prices were to be calculated for labour, public funds and foreign exchange, and consideration was also to be given to environmental costs. The completed project appraisal spreadsheet, together with the estimated shadow-prices, was intended to serve as a template for NFA to evaluate future proposals for development of the domestic tuna industry.

Appraisal of proposed domestic natural resource based projects is currently largely limited to financial aspects. While the benefit-cost framework which was used does incorporate financial appraisal, it also deals with a much wider range of social, economic and environmental costs and benefits. The anticipated benefits of the project are those which stem from a better decision-making process – taking advantage of projects which confer a net benefit on PNG, and avoiding projects which will result in net costs. In addition to NFA and FFA, other government departments were to be involved in the training workshops to be held in the course of the project and the benefit-cost framework is available to be applied in other areas, such as other fisheries, forestry and agriculture.

The overall aim of the project was to increase the capacity of NFA, FFA and other agencies, to perform independent economic analysis of proposed domestic tuna fisheries projects.

The specific objectives of the project were as follows:

1. modify an existing evaluation framework and apply the framework to measure the private and social net benefits of a locally-base tuna operation in PNG.

2. generalise the framework to be relevant for analysis of policy decisions regarding domestication of tuna and other industries.

5   Methodology

The project was set up to combine two lines of enquiry. At UQ a new spreadsheet-based framework for benefit-cost analysis of public and private projects had been developed and published in the form of a book (Campbell and Brown (2003)). In Papua New Guinea (PNG) a policy of encouraging a domestic fish processing industry had been adopted and government officials, mainly at the National Fisheries Authority, were analysing proposals for domestic processing of tuna caught in PNG's Exclusive Economic Zone in an attempt to determine the relative merits of these proposals in terms of the economic benefits to PNG.

Benefit Cost Analysis is a familiar tool for appraising proposed public projects. However, in a new development of the existing methodology, the technique has been adapted within a spreadsheet framework to appraise the benefits and costs of proposed private projects from a public interest viewpoint (Campbell and Brown (2003)). This new approach is ideally suited for the appraisal of foreign investment proposals, such as tuna canneries, from the perspective of the developing host economy. The project proceeded by applying this new framework to a representative cannery project in Madang, PNG.

Traditional benefit-cost analysis has assessed the net benefits of projects from the overall viewpoint of economic efficiency. While efficiency is an important consideration, especially from the viewpoint of international aid-donors, more information is required before the project can be predicted to improve the economic welfare of the host country. Fro example, it is necessary to appraise the proposed project from the viewpoint of the private firm, to ensure that it will, in fact proceed with it under the terms to be negotiated. It is also necessary to identify the subset of overall benefits which will accrue to the host country rather than to foreign participants in the project.

The new approach uses traditional microeconomic theory to identify the overall benefit of the project (the Efficiency net benefit). It uses conventional discounted cash flow methods to calculate the rate of return to the private proponent of the project, and it uses social accounting methods, which trace tax flows and other local effects through the economy, to calculate the net benefits to the host country. A project which provides an adequate return to the foreign company and at the same time confers significant benefits to the host country, in the form of tax flows, royalties, employment benefits and other advantages, without at the same time involving unacceptable costs in terms of resource depletion and environmental degradation, offers the real prospect of contributing to the development of the economy and the raising of living standards.

At the time Project ASEM/2004/011 was proposed there was one tuna cannery operating in PNG processing 150 mt of tuna per day, but two other projects were in the pipeline - at Wewak (120 mt/day) and at Lae (80 mt/day). Other foreign companies had expressed an interest in becoming involved and it was clear that there would be a rapid expansion of the industry. An interest in promoting a domestic processing industry is not unique to PNG but is shared by other countries in the region. In view of PNG's position in the forefront of this development in the western and central Pacific, it was decided to conduct the research in PNG, using an existing cannery as a case study, to develop a model which could be extended to other projects in the region. To ensure that the research met the needs of other countries in the Pacific Islands region the FFA was also included as a research partner.

A meeting involving the PNG and Australian project leaders, National Fisheries Authority (NFA) staff and Dr Gumoi, a member of staff at the University of Papua New Guinea, was held at the NFA, Port Moresby on July 19 2005 to discuss the broad outline of the project. It was confirmed that the RD fishing and canning project in Madang would serve as the case study for the research. It was agreed that one of the most significant benefits to the host country of a tuna cannery was in the form of employment benefits and that a

substantial part of the research effort in PNG would be devoted to this area. The design of a labour force survey was discussed in great detail at this meeting and the draft questionnaire was subsequently amended in discussions between Dr Gumoi and the Australian project leader.

The project was to proceed by gathering the detailed information about the Madang harvesting and processing project required for analysis within the spreadsheet framework. While most of the data collection was to be done by the NFA research assistant under the supervision of the project leaders, Dr Gumoi was engaged as a consultant to provide a review of the PNG and Madang Province labour markets and to advise on the design and implementation of the survey of the Madang tuna cannery's labour force. The results of this survey were used to calculate a shadow-price of labour and the consequent employment benefits of the project to PNG.

Other information required for calculation of shadow-prices included detailed information about PNG's tax structure and the operation of the foreign exchange market. The NFA and UQ research assistants assisted in this work and the project leaders were responsible for preparing papers that describe and calculate the shadow-prices. The papers, together with the supporting material, were uploaded to a website as they became available and were available to staff within NFA and other PNG government departments, and to other countries in the region through the FFA.

A paper on the PNG labour force and employment conditions in Madang Province was prepared by the consultant, Dr Gumoi of UPNG, as background to the proposed labour force survey at RD Canners, Madang (Project Paper 1). The Australian project leader and project staff met with RD officials in Madang on July 20. A further meeting to discuss progress was held at NFA on July 22. It was agreed that the labour force survey would carried out in November and December, 2005. The sampled employees (to be approximately 10% of the labour force) would be interviewed by three interviewers (economics postgraduate students at UPNG), supervised by Dr Gumoi and the ACIAR Project officer, Mr Tioti. The survey would be designed to obtain information on the family circumstances, skills, wages, employment opportunities and working conditions of male and female skilled and unskilled workers. The information obtained from the survey would be supplemented by payroll and employment data provided in confidence by RD.

The labour force survey was carried out between November 14 and December 7, 2005. The company's employee records were used to divide the indigenous labour force into four groups - unskilled and skilled females and unskilled and skilled males. Approximately ten percent of the names on each of these lists were selected at random to be in the survey pool. The interviewers were postgraduate students at the University of Papua New Guinea and were given some training before the survey took place. Three interviewers administered the survey - the two female interviewers dealt with the female employees and the male interviewer dealt with the males. Each interviewer was given a list of the randomly selected names and worked through the list as employees were available and time permitted. Since the interviews were conducted during day-time the sampled employees were members of the day-shift on the day of interview. Most interviews were conducted in a space provided by the company and the interviewee was given time off without penalty during their working day to be interviewed. A small number of interviews were conducted outside the factory. Each interview took around half an hour. In all, a total of 206 employees (approximately 10% of the labour force) was interviewed. (See the Appendix to this Report for a copy of the interview form). The breakdown of the numbers of completed interviews (with sample size as a percentage of the population) was: unskilled females - 85 (5.1%), skilled females 55 (20.4%), unskilled males 41 (13.9%), skilled males 25 (13.9%). The data obtained from the survey were entered in a spreadsheet file for analysis and the results of the survey were published in Project Paper 3, and were subjected to further analysis to calculate the shadow-price of labour (Project Paper 5), and the productivity of the employees.

The Australian project leader was provided by RD with details, in addition to the information obtained by NFA staff, on the operations of their cannery and preparation of a draft benefit-cost model was commenced and the model was detailed in Project Paper 2 which serves as a manual for other researchers wishing to compile a similar model.

The three project leaders met with the NFA and FFA project personnel in Port Moresby October 24-26, 2006 and conducted three workshops on the draft benefit-cost model. These workshops introduced the developing country partners to the methodology, format and results of the model and provided the Australian project leader with valuable suggestions for changes to reflect the situation and needs of the developing countries. In addition to the three project leaders (Ronald Kuk, Len Rodwell and Harry Campbell), the workshops were attended by 7 staff from NFA, representatives of other PNG government departments (the Department of Trade and Industry, the Investment Promotion Authority, the Rural Coastal Fisheries Development Program, and the National Research Institute), one representative from FFA, and one from the University of PNG. Following the workshops the model was revised and made available on the project website.

The benefit-cost analysis of a tuna cannery project presented in ACIAR Project Paper No. 2, and further developed in Campbell (2006a and 2006b), was based on the benefit-cost modeling approach developed in Campbell and Brown (2003). The approach allows for the inclusion of shadow-prices of inputs or outputs in two sets of circumstances: where market prices fail, for one reason or another, to measure the marginal cost (benefit) of the input (output); where the market in the input or output in question does not exist. The analysis reported in Project Paper 2 included preliminary estimates of shadow-prices for the following inputs or outputs: domestic labour; tuna catches; and pollution of one kind or another. Other outputs, such as contributions to public funds or foreign exchange earnings were not shadow-priced in the analysis presented in that paper.

For the purposes of the final benefit-cost model, it was necessary to review the case for shadow-pricing labour, tuna catches and environmental costs and to consider in detail the case for shadow-pricing public funds and foreign exchange earnings, in addition to a series of costs representing provision of inputs by local suppliers to the cannery. Project Paper 6 describes how shadow-prices for labour, tuna catches, environmental effects, public funds and foreign exchange were incorporated into the original benefit-cost model described in Project Paper No. 2 to produce the final model.

A member of the FFA staff, Linda Kaua, received additional training in the methodology and application of the cannery benefit-cost model developed in 2006 at a special training session conducted by the Australian project leader, September 17-18, 2007, at FFA headquarters in Honiara. Linda Kaua also travelled to Noro to collect data for the analysis of a tuna cannery project in the Solomon Islands. A presentation of her model was scheduled for the project workshop to be held in mid-2008.

The three project leaders met with the NFA and FFA project personnel in Port Moresby July 8-10 2008 and the Australian project leader conducted three workshops on the benefit-cost model. These workshops discussed the methodology, format and results of the final benefit-cost model. In addition to the three original project leaders (Ronald Kuk, Len Rodwell and Harry Campbell), the workshops were attended by Ronald Kuk's replacement as PNG Project Leader (from July 2008), Ms Margaret Ame, 11 other staff from NFA (including representatives of the Licensing Unit, the Audit and Certification Unit, Provincial and Industry Liason Unit, the Projects Management Unit, the Public Relations Unit, and the Fisheries Management Unit), 2 other staff from FFA's Fisheries Development Unit, and a representative of the Solomon Islands Central Bank.

At the workshop the results of the shadow-pricing research were presented by the Australian project leader and the revised model of the PNG tuna cannery was discussed. The FFA researcher, Linda Kaua, presented her model of the Solomon Islands cannery. It was agreed that Linda would pursue further applications of the model in the FFA region.

In the course of discussions at the Workshop the Australian project leader agreed to make further amendments to the benefit cost model and to write-up the results of the shadow-pricing research. The revised model, together with the final versions of the project papers would be placed on the project website, together with related publications which were developed in the course of the project.

6 Achievements against activities and outputs/milestones

6.1 Objective 1: To modify and apply an existing benefit-cost framework to evaluating domestic tuna processing projects

no.	activity	outputs/ milestones	completion date	comments
1.1	Develop a comprehensive spreadsheet framework for identifying and measuring the private and social net benefits of locally based tuna operations	Project Paper 2	December 2006	Project Paper 2 is a detailed description of the initial cannery benefit-cost model. It is written as a manual which can be used by an analyst to construct a similar model of a different project (A).
		Excel File: ACIARDOMCAN	November 2006	ACIARDOMCAN is a spreadsheet model of the benefit-cost analysis of the Madang tuna fishing and canning operation (A).
1.2	Shadow-prices which measure the true value of industry inputs and outputs	Project Paper 1	December 2005	Project Paper 1 is a review of labour market conditions in PNG generally and in Madang Province in particular (PC). Based on the result of that review a detailed survey of the Madang cannery labour force was conducted and the results reported in Project Paper 3 (A and PC). The results of the survey and were used to generate a shadow-price of labour as reported in Project Paper 5 (A).
		Project Paper 3	October 2006	
		Project Paper 4	July 2007	Project Paper 4 is a review of the fisheries sector in PNG (PC). Based on that review the shadow-price of the tuna catch was determined and reported in Project Paper 6 (A and PC). That paper also reported shadow-prices for foreign exchange and public funds, and discussed environmental costs.
		Project Paper 5	April 2008	
		Project Paper 6	November 2008	
1.3	Social Cost-Benefit Analysis of a representative project similar to the Madang harvesting and processing operations	Excel File: ACIARDOMCAN1	July 2008	The file ACIARDOMCAN1 I (A) is a revised version of the initial benefit-cost model. The most important revision was the incorporation of the shadow-prices of the inputs referred to above.
		Solomon Islands Cannery Spreadsheet Benefit-Cost Model		This model was developed by a member of the FFA staff under the direction of the Australian and FFA Project Leaders. It is being used for internal purposes in the FFA and is not available on the project website (A and PC).

PC = partner country, A = Australia

6.2 Objective 2: To generalize the framework to be relevant for analysis of policy decisions regarding domestication of tuna and other industries

no.	activity	outputs/ milestones	completion date	Comments
2.1	Workshop involving a broad range of stakeholders	Workshop 1	October 2006	The Australian project leader met with the NFA and FFA project personnel in Port Moresby October 24-26, 2006 and conducted three workshops on the benefit-cost model (see Section 4.5). These workshops introduced the developing country partners to the methodology, format and results of the model and provided the project leader with valuable suggestions for changes to reflect the situation and needs of the developing countries. In addition to the three project leaders (Ronald Kuk, Len Rodwell and Harry Campbell), the workshops were attended by 7 staff from NFA, one each from FFA, the Department of Trade and Industry, the Investment Promotion Authority, the Rural Coastal Fisheries Development Program, the National Research Institute and the University of PNG. Following the workshops the model was revised and made available on the project website.
2.1	Workshop involving a broad range of stakeholders	Workshop 2	July 2008	The Australian project leader met with the NFA and FFA project personnel in Port Moresby July 8-10 and conducted three workshops on the benefit-cost model. These workshops discussed the methodology, format and results of the final benefit-cost model. In addition to the three original project leaders (Ronald Kuk, Len Rodwell and Harry Campbell), the workshops were attended by Ronald Kuk's replacement as PNG Project Leader, Ms Margaret Ame, 11 other staff from NFA, 2 other staff from FFA, and a representative of the Solomon Islands Central Bank.
2.2	Case study conducted by FFA in the Solomon Islands	"The Solomon Islands Cannery Model" by Linda Kaua, FFA	2008	The Solomon Islands Cannery model was presented at Workshop 2 in July 2008
2.3	A publication detailing the lessons learned	www.uq.edu.au/ economics/tuna	2006-2008	It was decided by the Project Leaders that the publication should take the form of a website containing the project outputs. These were loaded up as they became available over the period of the project. In addition to the six project papers and the two Excel files referred to above, the website lists four papers which were developed from the project research and published as conference proceedings and journal articles.
2.4	A Guide to assessment of future tuna project proposals	Project Paper 2 Project Paper 6 ACIARDOMCAN ACIARDOMCAN1	2006-2008	ACIARDOMCAN and ACIARDOMCAN1 are Excel spreadsheet files which are a template for assessing domestic tuna processing projects. Project Paper 2 is the manual that describes the structure of the spreadsheet and Project Paper 6 develops and reports the appropriate shadow-prices.

PC = partner country, A = Australia

7   Key results and discussion

7.1   A description of the local labour force in a region with a large-scale tuna cannery

A study of the labour force in Madang Province, PNG (Project Paper No. 1), was conducted to assess the impact of a tuna cannery on a local labour market in the Pacific Islands region.

Of the 248,000 citizens aged 10 years and over counted in Madang province in the 2000 census, 156,000 were classified as being in the labour force. Of those, 151,000 were employed and 5,000 were unemployed. More men than women were in the labour force.

At the 1990 census, the labour force numbered 114,000 people: 106,000 employed and 8,000 unemployed. Between the two censuses, the labour force became slightly more feminized. In 1990, 60% of the labour force was male but by 2000 this had reduced to 53%: among employed people the male proportion reduced from 59% to 52%.: among the unemployed, the proportion who were male increased from 70% to 77%.

The overall labour force participation rate for citizens aged 10 years or more (ie, the proportion of the population who were economically active) was 65% in 2000. The rate was slightly higher for males (66%) than for females (63%). There was a marked difference in labour force participation between sectors. In urban areas about 48% of the population aged 10 years and over were in the labour force while in the rural sector about 67% of the population were in the labour force. Labour force participation was lowest for females in the urban sector (34%). This is partly because gardening/fishing for own or family use only, an activity undertaken by the majority of women in rural areas, is counted as employment even though it is a non-monetary activity.

At the 1990 census, the labour force participation rate was 67%, slightly higher than the 2000 figure. There were, however, a major change in pattern between the two censuses with increasing labour force participation by females and a reduction on the part of urban males, from 64% to 60%. This reduction is almost entirely attributable to a shift from being employed to not being in the labour force, possible caused by a perceived lack of employment opportunities.

In both urban and rural sectors, the pattern of labour force participation by age was similar for both sexes, increasingly sharply from the lowest rate for 10-14 years olds to plateau for age groups 20-24 years to 45-49 years in both sectors and declining thereafter. Generally, male labour force participation rate was higher than female but it should be noted that female labour force participation was higher than male in the youngest age groups in the rural sector, partly related to higher male participation in education at these ages as well as to the greater likelihood of young women helping in a family business or garden after school.

Despite this, there was very little difference between male and female labour force participation at any age in the rural sector. In the urban sector, however, males were at least 50% more likely than females to participate in the labour force between the ages 25-29 years and 65-69 years.

More than three times as many employed citizens aged 10 years and over were in non-monetary work as were in monetary work. However, this is due mainly to the high proportion of Madang's population in the rural sector where most non-monetary work is undertaken. In the urban sectors, monetary employment was about four times as common as non-monetary employment. There were also differences between the sexes with females more likely than males to undertake no-monetary work in the rural sector.

At the provincial level, subsistence employment was most common for both males and females, accounting for 60% and 77% of total employment, respectively. This was followed by wage jobs for males (14%) and gardening/fishing for money for females (8%). However, these aggregates at the province level mask the different activity patterns that exist in the urban and rural areas of the province. In urban areas, wage jobs were most common for both males and females, accounting for 81% and 54% of urban employment, respectively. Subsistence activity was also important for females (19%) but less so for males (7%).

In the rural sector of the province, 65% of male employment and 80% of female employment was subsistence activity. This was followed by family business without pay for males with 10% and gardening/fishing for money for females with 8%.

Consistent with the predominance of agricultural and fishing activities among type of employment, occupation was dominated by agricultural, animal and fishery workers (85% of all employed). This was even more pronounced in the rural sector where 89% of employed people were agricultural, animal and fishery workers. In the urban sector, the range of occupations was more diverse, particularly for those who were wage earners. Overall, 22% of the urban employed were in elementary occupations, a further 17% were agricultural, animal and fishery workers, and 15% were craft and building trade workers. These three occupation groups were also the most common among employed males including elementary occupation (24%), craft and building trade workers (20%), and agricultural, animal and fishery workers (11%). Among women, 28% were agricultural, animal and fishery workers, 18% were in elementary occupations and 14% were service workers, shop and market sales workers.

The pattern for people in wage jobs was quite different: 25% were in elementary occupations, 17% were craft and building trade workers and 12% each were teaching and associate professionals, and plant and machine operators and assemblers. Again the pattern varied between the sexes with males more than five times as likely as females to be craft and building trade workers and females over four times as likely as males to be clerks.

A similar situation held with industry. Overall, the largest industrial grouping in Madang was agriculture, hunting and forestry. It accounted for 74% of all employed people. By sector, the largest industrial grouping in the urban sector was wholesale and retail trade with 21%, whereas in the rural sector it was agriculture, hunting and forestry with 79%. The second largest grouping at the provincial level was wholesale and retail trade (14%). In the urban sector, agriculture, hunting and forestry is the second largest grouping employing 13%. Wholesale and retail trade also accounted for the same. Again, the range of industries was greater in the urban sector, particularly among wage earners.

Manufacturing, wholesale and retail trade and real estate, renting and business services activities each accounted for more than 10% of wage job employment of males. Transport, storage and communications industries were also significant employers of males. Among females, manufacturing, wholesale and retail trade, real estate, renting and business service activities and education were important sources of employment.

At the 2000 census, over 4,500 citizens aged 10 years and over in Madang were classified as unemployed, either looking for work (75%) or waiting to start a new job. Of the total unemployed, 54% were in the urban sector, giving an urban unemployment rate of 20%. The urban unemployment rate has decreased by 3% from 1990 (23%) to 2000 (20%). It probably represents a movement out of the labour force rather than an increase in employment. Unemployment in the rural sector was relatively rare but this is because of the high level of non-monetary subsistence activity. Nearly half of the unemployed in Madang at the 2000 census were aged 20-29 years.

The male unemployment rate in 2000 exceeded the female rate at all ages and was highest for people aged 15-19 years, 57% for males and 34% for females. With older age

groups, unemployment rates dropped significantly among males in the age groups 55-59 years and older and female unemployment dropped below 5% at age 45-49 and below.

Of the 85,000 people who were not in the labour force at the 2000 census, 32% had spent most of their time on housework and a further 21% had spent most time studying. This pattern varied by sex and age. Almost 68% of females and 39% of males aged 20-39 years reported their main activity as housework, and 35% of males and 33% of females aged 10-19 years as studying.

Growing food crops, vegetables and root crops and betel nut were the main activities that households were engaged in. Overall, 76% of households were engaged in growing food crops, vegetables and root crops and 71% were engaged in growing betel nut. Agricultural activities such as coconut, cocoa and livestock were also important to households with 59%, 40% and 39%, respectively of households engaged.

For those households engaged in growing food crops, vegetables and root crops, the majority (83%) grew for their own consumption. Over 90% of households engaged in growth of coffee or cocoa did so for cash.

The main agricultural activities in the urban and rural sectors were similar but at different levels. Betel nut, coconut and food crops, vegetables and root crops were the main crops grown by urban households mainly for own consumption. The other agricultural activities were livestock and rubber, mainly for own use, and cocoa mainly for cash. Other crops such as fruits, nuts, vanilla, chilli ginger and cardamom and sago were mostly grown for cash although less than 1% of households were engaged in growing them.

Selling betel nut, mustard and lime, and selling food crops and cooked food were common activities for generating income for all citizen households in Madang. About 54% of households were engaged in selling betel nut and mustard while another 44% were engaged in selling food crops or cooked food. Selling meat at the market or the roadside was the third common activity with 14% of households involved.

The pattern was similar in both the urban and rural areas. Of urban households, 24% were engaged in selling betel nut, mustard and lime and 15% were involved in selling food crops and cooked good as income generating activities. In rural households, 57% sold betel nut, mustard and lime as an income generating activity. Selling food crops and cooked food was also an income generating activity for 47% of households in Madang's rural sector.

The review of the Madang labour market suggests that, while there is a large informal economy, with many workers involved in subsistence-related pursuits, these activities should not be discounted in estimating the benefits of employment in a tuna cannery.

7.2　The characteristics of the Madang cannery labour force

In 2005 there were 2530 PNG nationals employed in the cannery 1939 females and 591 males. Most employees were engaged in occupations requiring low skill levels. These occupations are categorized as "crew" – factory floor worker – or "loiner" – a fish filleter. People employed in these positions are referred to as "unskilled", although, strictly speaking, this description refers to the occupation rather than the characteristics of the employee. All other occupations in the cannery are referred to as "skilled". On the basis of this classification 555 employees are skilled and 1975 unskilled. Using this classification of skilled and unskilled positions, the composition of the indigenous labour force is as described in Table 1:

Table 1: Composition of the Cannery's Domestic Labour Force

	(% of total)	
	Male	Female
Skilled	11.66	10.65
Unskilled	11.70	65.98

A sample payroll record indicates that the average wage of skilled employees is 163.92 Kina per fortnight and that of unskilled employees is 78.50 (a Kina exchanges for US$0.31 approximately). The minimum wage is 74.40 Kina per fortnight. The annual wage bill for skilled administrative, marketing and production workers is reported at 2.15 million Kina and that for unskilled production workers at 3.99 million Kina. These figures include the 7.7% employer National Provident Fund (NPF) contribution. The total wage bill of around 6 million Kina partly reflects the opportunity cost of the local labour force, but it also includes some employment benefits to PNG. The NPF contribution plus any income taxes paid are part of the net benefit, and any difference between the take-home pay of workers and the opportunity cost of their time must also be included as a benefit. The purpose of the labour force survey is to obtain data that could be used to estimate the size of the employment benefits generated by the cannery.

The results of the survey are reported for the four categories of workers - unskilled females (USF n=85), skilled females (SF n=55), unskilled males (USM n=41) and skilled males (SM n=25). The mean responses are grouped under the headings personal characteristics, earnings and deductions, home circumstances, education, employment history, work and travel time, alternative uses of time, and value of time. The value of time is discussed in detail in a later part of this report and will not be reported in detail in this section.

7.2.1 *Personal characteristics*

Employees were classified as unskilled or skilled depending on the type of work they did in the cannery. Workers classified as skilled are found to have more years of formal schooling than unskilled workers: in the tests for a significant difference between means of highest grade completed between unskilled and skilled workers the t-statistics were 6.8632 (df=132) for females and 2.0287 (df=42) for males. For both sexes a higher proportion of workers classified as skilled had a trade certificate than was the case for unskilled workers (for females Z=3.2440, for males Z=3.2197). However there was no significant difference between the proportions of skilled female and male workers who held trade certificates. These results seem to hold also for diplomas and degrees although relatively few workers have such qualifications. Overall the results suggest that the classification of worker based on the type of work does tend to identify the skill level of the employee.

Average household size is in the range 4.5-6.5 persons with unskilled workers tending to live in larger households. For roughly half the sample, the employee is the sole income earner in the household. Unskilled and skilled females contribute 36% and 31% respectively of total household income. Recalling that skilled females earn around twice the pay of unskilled females, these percentages suggest that there is more employment activity in the households of skilled than of unskilled females. However neither the proportion of employed spouses or the take-home pay of other household members is significantly different between the unskilled and skilled female samples at the 5 per cent level. However the earnings of other household members is significantly higher for skilled than for unskilled female employees at the 10% significance level (t=1.6310, df=69). Unskilled and skilled males contribute 44% and 63% respectively of total household income, and there is no significant difference between the take-home pay of other members of the households of unskilled and skilled males.

7.2.2 *Employment characteristics*

Two estimates of fortnightly pay were obtained: the company reported pay and deductions for each sampled employee for a pay period about three months before the survey; and the employees reported their normal fortnightly take-home pay. The latter estimate was slightly higher than the former, perhaps because interviewees tend to exaggerate their pay in order to impress the interviewer. Using the company record of fortnightly pay it is clear that, as expected, skilled workers earn more than unskilled workers: in the case of females the t-statistic for the test for a significant difference between mean pay of unskilled and skilled workers is 6.7022 (df=60) and in the case of males it is 5.2408 (df=30). It is also the case that, on average, skilled males earn more than skilled females, with a t-statistic of 2.5025 (df=30). Skilled workers have generally held their job for longer than unskilled workers, but in both cases the average length of tenure exceeds 2 years. However there is substantial variation in length of tenure which suggests a significant amount of labour turnover.

The fortnightly pay data can be compared with the minimum wage of 74.40 Kina. It can be seen that unskilled workers earn slightly more than the minimum whereas skilled workers earner more than twice the minimum. The amount of tax paid as a percentage of gross pay can be calculated for each group and weighted by the share of each group in total employment to give a value of 1.02% as the average tax rate. A similar calculation can be done for the employees' superannuation contributions to give 1.96%. The company superannuation contribution is 7.7%.

Few of the sampled employees had previously held a job: 38 employees reported having previously held a full-time job and 15 a part-time job in the combined sample of 206 persons. In the absence of employment at the cannery, skilled females would spend more time at another job than unskilled females (t =4.5051, df=72) but no significant difference in alternative job opportunities is detected for males (t=1.1293, df=41). Unskilled males would spend more time in further education than unskilled females (t=3.9193, df=61) but a similar difference does not exist for skilled workers (t=1.7840, df=31). Conversely skilled workers would spend relatively less time in subsistence activities, such as gardening, hunting, fishing and handicrafts.

The employees have long working days by developed country standards - around 11 hours including breaks. While most employees live on average around 3-6 kilometres from the cannery the average travel time is around 2.5 hours per day, reflecting the level of transportation services available.

7.2.3 *Value of time*

Respondents were asked to place a value on their job. This information was requested in two different ways (Questions 23 and 24 in the survey) which were intended to pose the question in a non-threatening manner. Nonetheless some respondents declined to answer either one or both of the questions. There were more responses to Question 23 than 24, and the coefficient of variation of the responses to Question 23 was lower than for those to Question 24. For these reasons, the responses to Question 23 are used to examine the value placed on time as described below.

7.3 The opportunity cost of workers' time and the calculation of employment benefits

The three components of a cannery worker's private opportunity cost of labor are the value she places on her work and travel time, the amount of tax and superannuation contributions deducted from her pay, and deductions to cover employment expenses in the form of transport, protective clothing and the like. The take-home pay is the gross wage less the tax and superannuation deductions and employment expenses, and the take-home pay less the value placed on work and travel time is the value the individual

places on her job - the employment benefit. This value was estimated from the responses to the survey of the cannery labor force.

As noted above one of the questions posed during the interview asked the respondent to specify the lowest amount of money per fortnight a friend and fellow-worker similar to themselves would accept to quit their job and spend their time any way they choose. The question was framed in the context of a friend and fellow-worker to make it less threatening by putting the response at one remove from the respondent's valuation of their own time and any perceived implications for their pay. Of the 206 employees interviewed 182 provided an answer to this question and the analysis was based on that sub-sample.

Based on the analysis of the survey responses,the social opportunity cost of the work and travel time of the cannery's domestic labor force as a whole was calculated by summing the product of mean opportunity cost for each category of worker and the number of workers in that category across the four categories of worker. The resulting value was then be expressed as a ratio to the gross wage bill to calculate a shadow-price of labour. Three shadow-prices are calculated corresponding to three assumptions about the productivity of labour in the economy: if the private opportunity cost of time is used as the estimate of social opportunity cost, SOC1, the corresponding estimate of the shadow-price of labour is α_1 = 0.57; if the private value of subsistence activity is netted out of private opportunity cost to give the estimate of social opportunity cost, SOC2, the shadow-price is α_2 = 0.49, and if the private values of both subsistence activity and alternative employment are netted out to yield SOC3, the shadow-price is α_3 = 0.40.

It can now be shown how the results reported above are used to calculate the employment benefits generated by a tuna cannery or similar operation. In this calculation the intermediate value of the shadow-price of labour, α_2, will be used, but the calculation could readily be performed for the other values reported. The gross fortnightly wage bill for local employees in the Madang cannery is 284,503 Kina. Multiplying this value by $(1 - \alpha_2)$ gives an employment benefit estimate of 145,096 Kina per fortnight. The other related benefit to the host country consists of personal income tax and superannuation payments of 10,822 Kina. The balance of the gross wage bill consists of work expenses of 10,569 Kina and the opportunity cost of time amounting to 118,016 Kina. On this basis the annual employment benefit generated by the cannery, assuming a 24 fortnight year, is 3,482,304 Kina or $1,149,160. This figure, rather than the gross wage bill of $2,253,360, is the annual value to be considered when comparing the employment benefits to any costs of attracting foreign investment in the cannery. Estimates of this value based on the shadow-prices α_1 or α_3 can be obtained by a similar calculation.

The distribution of the annual employment benefit among the four groups of employees is as follows: unskilled females - $613,645 (53%); skilled females - $165,994 (15%); unskilled males - $118,033 (10%); and skilled males - $251,489 (22%). On a per capita basis the annual benefits accruing to members of the respective groups are: $368, $616, $399, and $853. These benefits are significant when compared with a minimum wage equivalent to $589 per annum. It can be seen that, on a per capita basis, skilled workers benefit significantly more than unskilled workers, despite their higher opportunity cost of time, and males benefit by more than females.

7.4 Education and labour productivity in Papua New Guinea's tuna industry

An analysis was conducted of the data obtained from the sample of tuna cannery workers in Madang, Papua New Guinea (PNG). The analysis examined some aspects of the contribution of higher levels of education to increased labour productivity. One possible

contribution to increased labour productivity lies in more highly educated people being more likely to be able to move from the informal sector of the economy to the formal sector, but the analysis is unable to measure this effect since the sample is drawn from workers in the formal sector only. Two other possible effects, which can be measured by the analysis, are that, of those workers who do move into the formal sector, the more highly educated workers are more likely to be appointed to more productive (or skilled) positions, and that more highly educated workers will be more productive in whatever position, skilled or unskilled, they attain.

The gross wage measures the value of the marginal product of labour if the employer is competitive in both the product and labour markets. While the canned tuna market is highly competitive, a tuna cannery is a very significant employer in the local labour market and may enjoy some monopsony power. If this power is exercised the gross wage will understate the productivity of all categories of labour: the value of the marginal product of any type of labour will be measured by the gross wage multiplied by $(1 + 1/e)$ where e is the elasticity of supply of that type of labour. If the company faces a lower supply elasticity of skilled than of unskilled labour, and if it exercises monopsony power, differences in gross wages between skilled and unskilled labour will understate differences in productivity, and hence understate the contribution of education to increasing productivity.

The analysis started with a brief description of the local labour market, the tuna cannery, its labour force, and the sample of workers. A Probit model was used to estimate the effect of higher levels of education on the probability of being hired to a skilled as opposed to an unskilled position. The effects of higher levels of education on the wages of skilled and unskilled workers respectively were examined, and tests were conducted for the existence of sex discrimination in the labour market.

The results of the Probit analysis suggested that more education is associated with an increased probability of getting a skilled position and earning a higher wage if hired. The expected value of the higher wage as a result of an extra year of schooling is 179.53 kina per annum which is 6.8% of the sample average wage, and as a result of a tertiary qualification it is 388.08 kina per annum which is 14.73% of the sample average wage. The earnings functions estimates suggested that extra schooling also places the skilled worker higher in the wage distribution of skilled workers, but has no effect on unskilled worker's wages. The pooled earnings functions indicated that the difference between the mean wages of skilled male and female workers was mainly attributable to the sex difference and differences in education levels. However the differences in earnings attributable to sex were not thought to be the result of sex discrimination in the workplace but rather to more general economic and social conditions.

7.5 Fisheries policy and management in Papua New Guinea

The fishing industry in Papua New Guinea remains highly underdeveloped despite the fact that the country is endowed with extensive fishing grounds as characterized by its many islands and the large extent of ocean within its 200-mile exclusive economic zone. The total area within the 200-mile exclusive economic zone stretches to a total area of 2.4 million square kilometres, which is the basis of the marine fisheries of Papua New Guinea. Current legislation caters for only the management of commercial and industrial fisheries. Subsistence and artisanal fisheries involving the majority of Papua New Guineans remain largely unregulated, unmanaged and unsupported.

An overview of Fisheries Policy since the inception of the Fisheries Act of 1984 to the current Fisheries Management Act of 1998 was conducted and reported in Project Paper 4. The paper provided a brief historical overview of the fisheries resource then focussed on the management issues of the resource since the inception of the Fisheries Act of 1984, including a discussion of the problems that have plagued the industry. Theoretical and practical aspects of the management instruments were discussed. The paper

concluded with a brief summary of the enforcement and monitoring mechanisms provided for under the current Fisheries Management Act, 1998.

Specific issues examined in the paper include property rights and fisheries management, bioeconomic models of fishery exploitation, different approaches to fisheries management, fisheries production, and current problems in the fisheries sector and how these are being addressed. Based on the discussion of management issues a set of eight recommendations for changes to the approach to fisheries management was put forward.

7.6   A case study of a tuna fishing and processing operation in PNG

The case study is a generic tuna fishing and canning operation in Papua New Guinea (PNG). While the case study is loosely based on an actual operation the data used are derived from several sources and the study should not be interpreted as a detailed analysis of any particular operation.

7.6.1   *Fishing*

Twelve second-hand purse seiners, together with support vessels, will be imported and allocated to tuna fishing in PNG's EEZ using fish attracting devices (FADs) known as payaos. The vessels will have access to all waters of PNG including the Territorial Sea and the Mogardo Square, the Archipelagic Waters and the off-shore areas of the EEZ. They will catch skipjack and yellowfin tuna in the approximate proportions 80% and 20%, and in quantities sufficient to supply the cannery with up to 32,000 metric tons of raw tuna per year, based on an eleven month operating year. The fleet is valued at around US$19 million (2004 US$). Onshore facilities consisting of a wharf and an ice plant, together with pre-production expenses, will cost an additional $3 million. Operating costs, excluding fishing licences, are estimated at $133,000 per month. The vessels will be crewed by foreign labour, although it is recognized that jobs for local residents could become available over time.

7.6.2   *Canning*

The processing capacity of the cannery is rated at 24,000 metric tons of raw tuna per year, but it is expected to operate at 32,000 tons. The cost of capital items, including land, improvements, buildings, other fixed investment and working capital, will be $7.85 million. Production costs, including the cost of raw tuna purchased from the fishing operation, labour, materials, water, electricity and miscellaneous items will be $6.17 million per annum. Administrative and selling costs, including marketing, freight and security, will be $4.51 million per annum.

7.6.3   *Markets*

Canned tuna will be exported to the US and the EU, and also sold locally in PNG. Fishmeal is a by-product which is assumed to be sold locally and sales of by-catch locally will also generate a small amount of revenue.

7.6.4   *Employment of local labour*

An operation of this nature employs around 2500 PNG nationals, predominantly in the cannery. Of these employees, 20% hold positions which can be classified as skilled and the remainder hold unskilled positions. There are three shifts per day – a permanent day shift and two other shifts which rotate every fortnight. The total annual wage bill for local labour is around US$2 million (at the exchange rate of $0.31 to the Kina): this consists of administrative and marketing payroll (around 20%); skilled production workers (around 15%); and unskilled production workers (around 65%). The average wages of skilled and unskilled workers in PNG tuna canneries are around 165 and 80 Kina per fortnight respectively (as compared with a minimum wage of 74.40 Kina (US$23)).

In Project Paper 2 an extensive description of the benefit-cost model was provided so that it could be replicated by other users. The use of the model in sensitivity and scenario analysis was illustrated, and the following results were presented. However it was noted that the cost and revenue data used in this preliminary model (ACIARDOMCAN) are subject to further revision and that the results are of a preliminary nature.

First, the user might want to check how sensitive the results are to the values chosen for the shadow-prices: some of these values are based on research, but some are set at unity (land, power, light and water, and security) or zero (licence and registration fees) for convenience, or set at arbitrary values (opportunity cost of the catch, external costs imposed by the fishery and the cannery) for completeness. Since changing the values of the former set of shadow-prices would make little difference to the results, discussion will be confined to the opportunity cost of the catch and the external costs. All changes are considered individually and compared with the base case reported in the paper.

If PNG's tuna catch can be sustained at a level high enough to supply the cannery without affecting the catches, and hence the access fees paid, by DWFNs the opportunity cost of tuna estimate should be changed to zero. This would result in a NPV gain of $19.66 million to the referent group. In examining external costs there is no range of possibilities to guide the user. One approach is to calculate the threshold value: how large would the external cost per ton of fish caught and processed have to be to render the project uneconomic? By experimenting with the external costs values it can be found that the cost has to be set at $155 per tonne for both the cannery and the fishery to render the project uneconomic according to the efficiency analysis. Since the costs of pollution are borne entirely by the host country the project will cease to be attractive to the referent group before this threshold is reached; it can readily be ascertained that the threshold value for the host country is $43 per tonne. As compared with the base case the figure of $155 per ton puts a ceiling on the pollution mitigation costs that could be justified to make the project viable on environmental grounds.

The proponent of the project is assumed to be a foreign firm which wishes to enter into negotiations with the decision-maker, representing the referent group, about the conditions under which the project might proceed. Given the data which have been used (and which were still subject to revision) the firm's real internal rate of return, with no concessions, is 18%. If the firm's cost of capital is around a real rate of 20% there is no possibility of it proceeding without some of its demands for concessions being met. The concessions can be granted or withheld by changing the values of the tax and fee switch variables. The analysis considered concessions individually as compared with the base case. It should be noted that the effects of the individual tax concessions are not necessarily additive; for example, the effect of a 5-year tax holiday depends on whether the company is treated as a resident or foreign company.

The first switch variable to consider is whether the company needs the exemption from the 24% EU tariff under the Lome Convention. Since the company is assumed to bear the full incidence of this tax a successful application by PNG would not benefit the referent group, but it can ascertained that withholding this concession would lower the firm's IRR to 14%. The next variable to consider is the access fee. If the firm's vessels were foreign-rather than domestic-flagged, the IRR would fall to 14% as compared with the base case.

The next group of variables to consider is the set of switch variables determining the tax regime the firm will operate under. Some care is required here for tax concessions will impinge differently on different levels of government: direct tax revenues, and some indirect taxes such as import and export duties, accrue to the central government, which others such as land tax and VAT accrue to the provincial government. If the firm is treated as a non-resident company for tax purposes its IRR falls to 14%.

It can be argued that having a model of this nature to consult is a significant advantage to the decision-maker charged with negotiating with the firm. Questions as to the accuracy of

the cost and revenue data used in the model can be resolved by the two parties in a cooperative manner, and revised data can be entered in the spreadsheet.

7.7 Shadow-prices for benefit-cost analysis of tuna processing projects in the Pacific Islands region

The benefit-cost analysis of a tuna cannery project described above (Project Paper No. 2) was further developed in Campbell (2006a and 2006b). These studies were based on the benefit-cost modeling approach developed in Campbell and Brown (2003). The approach allows for the inclusion of shadow-prices of inputs or outputs in two sets of circumstances: where market prices fail, for one reason or another, to measure the marginal cost (benefit) of an input (output); and where the market in the input or output in question does not exist. The analysis reported in Project Paper 2 included shadow-prices for the following inputs or outputs: domestic labour; tuna catches; and pollution of one kind or another. Other outputs, such as contributions to public funds or foreign exchange earnings were not shadow-priced in the analysis.

The purpose of Project Paper 6 was to review the general case for shadow-pricing inputs or outputs such as labour, locally provided services, tuna catches, environmental effects, public funds and foreign exchange in the benefit-cost model and to calculate some of these shadow-prices. The paper describes how shadow-prices for labour, tuna catches, environmental effects, public funds and foreign exchange can be incorporated in the benefit-cost model described in Project Paper No. 2.

Shadow-prices have been considered for several categories of inputs and outputs of a domestic tuna canning and fishing operation in Papua New Guinea: local labour, locally provided services, tuna catches, environmental effects, foreign exchange, and public funds. It was found that the shadow-price of foreign exchange was not significantly different from the official exchange rate and that there was no need to include it in the benefit-cost analysis. The relative importance of the other shadow-prices can be judged from their impact on the measure of the Referent Group net benefits of the project. The benefit-cost model ACIARDOMCAN1 can be used to make this assessment.

The two most significant shadow-prices, in terms of their impact on the Referent Group analysis, are the shadow-prices of labour (around 50% of the market wage) and of tuna catches (6% of the gross value of the catch). Using a labour shadow-price of 50% of the market wage, the present value of the employment benefits generated by the project are estimated at US$20 million, around 60% of the Referent Group net benefits. Setting the opportunity cost of the tuna catch equal to the value of the access fees which would have been paid by foreign fleets implies a cost of US$20 million. This cost, however, can be recouped if the fishing vessels operated by the cannery are treated as foreign rather than domestic vessels for access fee purposes, and if the project remains viable from the private investors' point of view under this regime. The only other category of Referent Group benefit or cost which compares in magnitude with these two items are the direct tax revenues which are calculated at around $US20 million. Indirect tax revenues and contributions to the state-run pension fund add another US$10 million to this figure.

Shadow-pricing locally provided services at, say, 50% of their market prices increases Referent Group net benefits by around $US5 million, and shadow-pricing public funds, using the estimated public funds premium of 14%, results in an additional benefit of public funds generated by the project of around $4 million in the base case. The effect of shadow-pricing environmental costs has already been noted in the discussion of the Case Study.

The spreadsheet benefit-cost model, ACIARDOMCAN1, can assist decision-making in two main ways. First, it can be used as a template to generate a benefit-cost analysis of a proposed fishing and canning project with the resulting estimates of benefits and costs to the host country. Second, it can be regarded as illustrating the range and relative

importance of the benefits and costs likely to be generated by such a project for the host country. In this latter use the lessons to be drawn are the importance of employment benefits, tax revenues and the opportunity cost of the catch: provided that there are no exceptional circumstances, such as substantial environmental costs for example, reasonable estimates of these three categories of Referent Group benefits or costs would provide a basis for a rough estimate of the net benefits to the host country.

8   Impacts

8.1   Scientific impacts – now and in 5 years

The objective of the project was to apply an existing methodology (see Campbell and Brown (2003)) to a public policy issue in PNG and the Pacific Islands region and to increase the capacity of regional governments to assess proposals for domestication of the tuna industry. Consequently, there are no theoretical innovations to report.

The project has contributed to knowledge in the following areas: identification and measurement of the full range of costs and benefits associated with tuna processing activities in Pacific Islands economies; describing the nature of the labour market, and the size and structure of the indigenous labour force employed in a large scale cannery, together with an assessment of the alternative opportunities available to various categories of the employees; estimating the opportunity cost of critical outputs of, and inputs to, the tuna processing industry, including public funds, foreign exchange, labour and other factors.

The results of the research have been incorporated in a spreadsheet model of a domestic processing operation. Some government staff in the Pacific Islands region have been involved in developing this model and have received help and training in its use. Already some independent uses of the model and its approach are starting to emerge. It is to be expected that modifications and improvements to the model will be made by staff using it over the next several years.

8.2   Capacity impacts – now and in 5 years

The project increased the capacity of the NFA, the FFA and, through the FFA, that of other Pacific Island countries to perform independent economic analysis of proposed domestic fishery projects. The PNG, FFA and Australian project leaders worked closely in developing the spreadsheet model, and NFA and FFA staff received close supervision in the construction and operation of the cannery benefit-cost model. In addition to the PNG case study, Linda Kaua at the FFA is using the model to undertake a case study of a domestic tuna processing project in the Solomon Islands, and another study, using the model, is underway in The Federated States of Micronesia as the result of an approach to the Australian project leader by the researcher (Aggie Yeeting of Lincoln University, New Zealand) through the project website. Further applications of the model can be expected over the next few years as more government analysts become familiar with it through interaction with the current users and by accessing the material on the project website.

In the course of undertaking the project Partner Country staff learned a range of skills including economic analysis, operating spreadsheets (including using the various spreadsheet financial functions), conducting interviews with industry to obtain data, sample survey design and administration, and writing reports. These skills can be used in further project analyses in the region, as well as in related areas of public policy design.

The ACIAR Project Officer at NFA, Mr Jerome Tioti, received a John Allwright Fellowship and left the project to study Environmental Management and Development at the Crawford School of Economics and Government at ANU. He was replaced in the project by Mr Rodney Kirarock who had earlier contributed to the project as one of the three interviewees in the cannery labour force survey.

8.3 Community impacts – now and in 5 years

The project will have economic, social and environmental impacts through the design and selection of appropriate tuna processing projects in the Pacific Islands region.

8.3.1 Economic impacts

As noted in the discussion of the background to the project, getting the right balance between domestic and distant water fishing nation exploitation of its tuna resources is important for PNG's economic development. Earlier ACIAR projects examined this issue at a macro level, while the current project takes a micro approach - which proposals for domestic development should be pursued and which rejected? The ability to make the correct choices will contribute significantly to PNG's economic welfare through tax receipts, employment benefits and related effects. At the same time some pitfalls in the form of over-exploitation of the tuna resources or other form of environmental damage can be avoided.

The project has generated a body of software and has provided staff in PNG and other parts of the region with the skills to use that software in the selection of those projects that offer the biggest contribution to the national economy. At a broader level, it has heightened awareness of the issues that must be addressed in further development of the domestic tuna industry, particularly the opportunity cost of diverting output from an already fully exploited fishery from one use to another.

The project has also provided new information about the employment consequences of domestic tuna canneries in the region and the importance of education in acquiring the productive skills that lead to higher wages and improved living standards.

8.3.2 Social impacts

The tuna cannery in Madang, which is the model for further canneries in the region, employs around 2500 local residents, 1600 unskilled female workers, and around 300 workers in each of the skilled female, unskilled male, and skilled male category. The employment benefits resulting from the cannery are very important to the workers and the local economy. Using the benefit-cost model PNG should be able to negotiate other cannery projects that offer at least the same advantages.

A socio-cultural study (Sullivan et al. (2003)) of local communities to determine what changes had been observed over the first seven years of fishing and canning operations by the RD company located in Madang identified strains in the relationships between younger and older generations, as well as between men and women. Employment provided younger people, especially young women, with a degree of independence they did not have before, thereby creating stress as well as opportunities. There have also been tensions between traditional and new residents of the region, the latter consisting of migrants from other regions, as well as foreign workers, seeking employment.

While the benefit-cost model does not address the social costs of adjustment to the new opportunities offered by a cannery project, the project research has provided a great deal of information that can be used in assessment of future projects from a broad perspective.

8.3.3 Environmental impacts

The socio-cultural study (Sullivan et al. (2003)) also identified environmental problems associated with the cannery's operations. Local residents claimed that fish populations had declined in the lagoon because of habitat loss and over-fishing. Habitat loss is attributed to pollution from the fishing and canning operations, principally oil and chemical spills and human waste. Noise pollution was also cited as a serious problem.

There is no doubt that some resource-based projects in PNG and throughout the region have resulted in serious environmental costs. In the analyses conducted previously these

effects, while being acknowledged to some extent, have not been included in the benefit-cost analysis. Rather, at best, the decision-maker tends to have been confronted with an economic analysis, which may have been favourable, and an environmental impact statement which may have tended to be unfavourable, but with no way of reconciling the two kinds of effects. By insisting that the environmental costs be explicitly included in the benefit-cost analysis the spreadsheet model will focus attention on mitigation or prevention of adverse environmental outcomes. While the project was not intended to produce independent estimates of environmental costs, the spreadsheet is designed to calculate threshold effects - magnitudes of environmental costs which would make the project unviable from the developing country's perspective. Through comparison with the experience of other countries or industries in the region the decision-maker will be able to judge whether the proposed project is likely to approach these thresholds. This will result in a project with unacceptable environmental costs being rejected.

8.4   Communication and dissemination activities

Communication and dissemination of results was accomplished through workshops and a project website which has been regularly updated over the course of the project.

Project personnel met in Port Moresby October 24-26 and participated in three workshops on the benefit-cost model (see Section 4.5). These workshops introduced the developing country partners to the methodology, format and results of the model and provided the project leader with valuable suggestions for changes to reflect the situation and needs of the developing countries. In addition to the three project leaders (Ronald Kuk, Len Rodwell and Harry Campbell), the workshops were attended by 7 staff from NFA, one each from FFA, the Department of Trade and Industry, the Investment Promotion Authority, the Rural Coastal Fisheries Development Program, the National Research Institute and the University of PNG. Following the workshops the model was revised and made available on the project website.

Project personnel met in Port Moresby October 24-26 and participated in three workshops on the benefit-cost model (see Section 4.5).These workshops discussed the methodology, format and results of the final benefit-cost model. In addition to the three original project leaders (Ronald Kuk, Len Rodwell and Harry Campbell), the workshops were attended by Ronald Kuk's replacement as PNG Project Leader, Ms Margaret Ame, 11 other staff from NFA, 2 other staff from FFA, and a representative of the Solomon Islands Central Bank.

At the conclusion of the project the principal vehicle for communication and dissemination of results will be the project website which will be maintained (at the University of Queensland) for the foreseeable future. The website has already elicited enquiries from analysts, not originally involved in the project, in the Pacific Islands region wishing to employ the model.

9 Conclusions and recommendations

To this point the project can be judged a success, but it remains to be seen whether there is sufficient momentum to ensure continued application of the model developed by the project to policy implementation. Some further development of the model could be justified but the main recommendation concerns further developing the skills of the fishery authority staff who are required to implement the model as part of the decision-making process in the regional fishing industry.

9.1 Conclusions

The project has achieved its objective in developing a benefit-cost model which fishery authority staff in the Pacific Islands region can use to evaluate proposals for domestic development of the tuna processing industry. Further development of the model could be undertaken, especially in the area of environmental costs which the project assessed in a preliminary way on the basis of secondary sources. The labour force study could also be extended to consider further the question of skill acquisition, and to look at the local impact of cannery employees' expenditures.

The success of the project now depends mainly on the dissemination and application of the results The project output, including the spreadsheet models and research papers, is readily accessible on the project website and implementation of the model depends on the availability of fishery authority staff with the required economic expertise to implement it. Preliminary indications of success are positive, with two independent applications of the model underway already, but it remains to be seen what will happen when the momentum of the project is no longer there to stimulate activity.

9.2 Recommendations

It is recommended that consideration be given to conducting a study of the environmental costs of tuna cannery projects in the Pacific Islands region. While this study should include a comprehensive review of the literature, with a view to implementing the benefit transfer method of estimation, it also requires the gathering and assessment of primary data on the effects and perceived costs of cannery projects.

It is recommended that further resources be allocated to the training of fisheries authority staff who are responsible for estimating the domestic benefits and costs of proposed developments, assisting in negotiations, and advising policy makers on the best course of action. While the three-day workshops provided a valuable introduction to the technique of benefit-cost analysis, fisheries staff in the region have suggested that more intensive training, perhaps including coursework at university, would be desirable. Some training has already occurred as part of the project and one member of the project staff was funded, independently of the project, to study in a related area at ANU. Further funding for formal training in benefit-cost analysis techniques as part of a degree program, either at UQ where the model was developed, or at other institutions would be extremely valuable. Also useful would be the provision of short courses in benefit-cost analysis which would serve to reinforce and further develop basic skills of economic analysis.

It is recommended that consideration be given to establishing a mentoring program whereby regional fisheries staff applying the model can get assistance as problems arise. In the course of the current project this role has been carried out by the Australian project leader, and it would be desirable to have this service continued, perhaps by a consultant.

10 References

10.1 References cited in report

ACIAR Project 8928, *The Economics of Papua New Guinea's Tuna Fisheries*

ACIAR Project 9405, *A Bioeconomic Analysis of Tuna Purse Seining in the Pacific Islands Region*

ACIAR Project ASEM/2001/036, *Maximizing the Economic Benefits to Pacific Island Nations from Management of Migratory Tuna Stocks*

Campbell, H.F. and R.P.C. Brown (2003), *Benefit-Cost Analysis: financial and economic appraisal using spreadsheets*, Melbourne: Cambridge University Press.

Campbell, H.F. (2006a), "A Framework for Assessing the Net Benefits of Domestic Processing: the case of Pacific Island Tuna Fisheries", *Proceedings of the 12th Biennial Conference of the International Institute of Fisheries Economics and Trade*, Portsmouth, July 11-14, 2006. (http://oregonstate.edu/Dept/IIFET)

Campbell, H.F. (2006b),"Measuring the Benefits of Domestic Tuna Processing", *Pacific Economic Bulletin* Vol. 21, No. 3, November 2006, pp. 88-97.

Landu, H., D.A. Troedson and G.H. Waugh (1994), "Cannery Costs on the Western Pacific: a hypothetical model", in *The Economics of Papua New Guinea's Tuna Fisheries,* H.F. Campbell and A.D. Owen (eds), Canberra:ACIAR, pp. 218-228.

McCoy, M.A. and R. Gillett (1997), *Foreign Tuna Purse Seining in the Pacific Islands: the current situation and business operations*, Report prepared for the Forum Fisheries Agency, pp. 88.

Munro, G.R. (1985), "Coastal States, Distant Water Fleets and EFJ: some long-run considerations", *Marine Policy* Vol. 9, pp. 2-15.

RD Tuna Canneries Pty Ltd and RD Fishing PNG Pty Ltd (1994), *A 100 ton/day Tuna Cannery Proposal for Madang, Papua New Guinea*, Schedule A.

Sullivan, N., T.Warr, J.Rainbubu, J.Kunoko, F.Akauna, M.Angasa and Y. Wenda (2003), *Tinpis Maror: a Social Impact Study of Proposed RD Tuna Cannery at Vidar Wharf Madang*, (nsullivan@global.net.pg) pp. 142.

10.2 List of publications produced by project

Project Papers

Gumoi, M.T. (2005), "Papua New Guinea's Labour Market and Labour Force", Australian Centre for International Agricultural Research, Project ASEM/2004/011, Project Paper No. 1, pp. 21 (www.uq.edu.au/economics/tuna)

Campbell, H.F. (2006), "A Benefit-Cost Model for Assessing the Net Benefits of Domestic Tuna Processing Projects: methodology, reference manual and spreadsheet file", Australian Center for International Research, Project ASEM/2004/011, Project Paper 2, pp.33. (www.uq.edu.au/economics/tuna)

Campbell, H.F. (2006), "Characteristics of the Indigenous Labour Force of a Tuna Processing Plant in the Pacific Islands Region", Australian Center for International Research, Project ASEM/2004/011, Project Paper 3, pp.21. (www.uq.edu.au/economics/tuna)

Kuk, R. and J. Tioti (2007), "Fisheries Policy and Management in Papua New Guinea", Australian Center for International Research, Project ASEM/2004/011, Project Paper 4, pp.41. (www.uq.edu.au/economics/tuna)

Campbell, H.F. (2007), "The Shadow-Price of Labour and Employment Benefits in the Tuna Canning Industry in Papua New Guinea", Australian Center for International Research, Project ASEM/2004/011, Project Paper 5, pp.14. (www.uq.edu.au/economics/tuna)

Campbell, H.F. (2008), "Shadow-Prices for Benefit-Cost Analysis of Tuna Cannery Projects in Papua New Guinea", Australian Center for International Research, Project ASEM/2004/011, Project Paper 6, pp.19. (www.uq.edu.au/economics/tuna)

Project Files

ACIARDOMCAN - an Excel spreadsheet-based benefit-cost analysis of a tuna cannery in Papua New Guinea (www.uq.edu.au/economics/tuna)

ACIARDOMCAN1 - an Excel spreadsheet-based benefit-cost analysis of a tuna cannery in Papua New Guinea, incorporating shadow-prices (www.uq.edu.au/economics/tuna)

Other Published Papers

Campbell, H.F. (2006), "A Framework for Assessing the Net Benefits of Domestic Processing: the case of Pacific Island Tuna Fisheries", *Proceedings of the 12th biennial conference of the International Institute of Fisheries Economics and Trade*, Portsmouth, July 11-14, 2006. (http://oregonstate.edu/Dept/IIFET)

Campbell, H.F. (2006),"Measuring the Benefits of Domestic Tuna Processing", *Pacific Economic Bulletin* Vol. 21, No. 3, November 2006, pp. 88-97.

Campbell, H.F. (2007), "Education and Labour Productivity in Papua New Guinea's Tuna Processing Industry", *36th Australian Conference of Economists*, Hobart, 24-26 September, pp.14 (www.cdesign.com.au/ace07)

Campbell, H.F. (2008), "The Shadow-Price of Labour and Employment Benefits in a Developing Economy", *Australian Economic Papers,* December, pp. 311-319.

11   Appendixes

11.1   Appendix 1: The labour force survey questionnaire

COVER SHEET - TO BE COMPLETED BY THE INTERVIEWER:

INTERVIEWER NAME:_____DATE:_____

NAME OF EMPLOYEE:_____

EMPLOYEE POSITION (circle one): ADMIN ENGINEERING PRODUCTION

EMPLOYEE NUMBER:_____

SAMPLE NUMBER:_____ (from Interviewer's sample list)

DESCRIPTION OF THE SURVEY (to be read out to the interviewee)

"The National Fisheries Authority is conducting a study of the benefits to Papua New Guinea of domestic processing of fish caught in PNG waters. Your name has been chosen at random to be included in a survey of the benefits to employees of the fish cannery. The company has agreed to provide some information about your work and pay, and your supervisor will allow you to be absent from your job, without any deduction from your pay, for the short time that will be required to answer a few questions about yourself, your work and how you spend your time. Your name will not appear on the completed questionnaire. Are you willing to be part of the study and to talk to me for a few minutes and answer a few questions?

Thank you very much." (enter the Sample Number on the survey questionnaire, detach this cover sheet and place it in a folder)

DATA TO BE SUPPLIED BY RD:

Fortnightly take-home pay:_____ kina

Fortnightly Deductions: lunches:_____ kina

transport:_____ kina

clothing: _____kina

taxes:_____ kina

superannuation:_____ kina

other (specify):_____kina

/PAGE 2

SURVEY QUESTIONNAIRE

(This part to be completed by the interviewer before asking the questions)

INTERVIEWER NAME:_____DATE:_____

INTERVIEWEE SAMPLE NUMBER:_____

SEX (circle one):   FEMALE   MALE

QUESTIONS

1. Can you please tell me your age? (if the interviewee is unwilling to answer this question, the interviewer should enter an approximate value and tick the space provided)

          AGE:_____   APPROX_____

2. Are you married (circle one)?   YES   NO

3. How many children do you have? _____

4. In which village do you currently live? _____

5. Who else lives in the house where you live? (circle answers)

          SPOUSE

          YOUR CHILDREN   HOW MANY:_____

          PARENTS AND/OR SPOUSE'S PARENTS HOW MANY:_____

          OTHERS   HOW MANY:_____

6. Of the people who live in your house, who has a paid job? (circle answers)

          SPOUSE   Full-time   Part-time

          PARENTS   Full-time   Part-time

          OTHERS (Specify):_____ Full-time   Part-time

                              _____ Full-time   Part-time

/PAGE 3

7. What is the approximate total take-home fortnightly pay of the members of your household, other than yourself?

_____kina per fortnight

8. At what age did you stop full-time education?_____years

9. What is the highest level of education you have completed?

SCHOOL GRADE (circle one): <5 5 6 7 8 9 10 11 12

OTHER (circle one): certificate/trades   diploma   degree

10. What is your current job with RD Canners?_____

11. For how many weeks have you held your current job?_____weeks

12. How long do you expect to continue working at the cannery?

_____weeks   Or   INDEFINITELY

13. How many days do you expect to work this week at the cannery?_____days
(The answer to this question is to be entered in Question 20)

14. During this present week, at what time do you normally start work?_____am/pm

15. During this present week, at what time do you normally finish work?_____am/pm

/PAGE 4

16. What is your fortnightly take-home pay (after all deductions)? _____kina

17. Did you hold a job before your current job in the cannery?

       YES   NO

If YES:

Was the job   FULL-TIME   PART-TIME   (circle one)

What was the nature of the job?_____

For how many weeks did you hold the job?_____weeks

What was your fortnightly take-home pay?_____kina per fortnight

Why did you leave your previous job?_____

_____

18. During this present week:

      (i) At what time of day do you leave home to journey to work?_____am/pm

      (ii) At what time of day do you get back home from work?_____am/pm

(Interviewer to calculate number of hours expected to be spent working or traveling to work each day this current week: subtract 18(i) from 18(ii)and enter it in the space provided in Question 19))

19. Your answer to the previous question (Question 18) suggests that you expect to

spend _____hours per day working or traveling to and from work
(Interviewer to supply number calculated in Question 18 above)

/PAGE 5

20. You mentioned earlier that you expect to work _____ days this week

(Interviewer to supply answer to Question 13 above)

This means that you expect work, and travel to and from work, to take up

_____ hours of your time this week

(Interviewer to supply number: number of days worked (question 20) times number of hours per day working or traveling (Question 19))

Does that sound right?

YES   NO   (circle one)

If NO repeat questions 13 and 18 and modify answers

21. From what you have told me you expect to spend _____ hours this week either working or traveling to or from work. (Interviewer to insert the number of hours from Question 20).

If you were not working at the cannery, how would you spend those _____ hours per week?

	Number of Hours
Working at another paid job	_____
Education or Training	_____
Gardening/Hunting/Fishing/Handicrafts	_____
Selling home produced items (food, handicrafts etc.)	_____
Looking after children or relatives	_____
Working in the home (cleaning, cooking etc.)	_____
Leisure activities (sports, spend time with friends etc.)	_____
Resting or Sleeping	_____
Other (specify) _____	_____
TOTAL:	_____

(Interviewer should discuss the answers, and make changes where necessary, until the total number of hours adds up to the number of hours per week spent at the cannery or in travel to and from work)

/PAGE 6

22. If the interviewee nominated Working at another paid job in Question 20 ask the following question (otherwise go to Question23):

You said that if you were not working at the cannery you would expect to be working at another job.

What kind of job would you be working at?_____

What hourly wage would you expect to be paid?_____kina per hour

23. Can you think of a friend, similar to you, who is currently working in the cannery?

     YES   NO   (circle one; if NO go to 24)

If YES:

What do you think is the lowest amount of money per fortnight your friend would accept to quit their job and spend their time any way they choose?

_____kina per fortnight

24. Can you think of a friend, similar to you, who is not currently working in the cannery but who might like a job similar to yours?

     YES   NO   (circle one; if NO go to END)

If YES:

What do you think would be the lowest amount of take-home pay per fortnight that your

friend would be willing to work for?

_____kina per fortnight

/PAGE 7

END OF QUESTIONNAIRE

That's all the questions I have. Is there anything else you think I should know about you or your job?

_____

_____

_____

_____

Thank you very much for helping us with this important study.

/PAGE 7