Policy Options for the Tree Crop Industries in Papua New Guinea

EUAN FLEMING[1] AND CHARLES YALA[2]

1. Department of Agriculture and Resource Economics, University of New England, Armidale NSW 2351
2. Economic Studies Division, Papua New Guinea National Research Institute, PO Box 5854, Boroko NCD, Papua New Guinea

The Australian Centre for International Agricultural Research (ACIAR) was established in June 1982 by an Act of the Australian Parliament. Its primary mandate is to help identify agricultural problems in developing countries and to commission collaborative research between Australian and developing country researchers in fields where Australia has special competence.

Where trade names are used this does not constitute endorsement of nor discrimination against any product by the Centre.

ACIAR MONOGRAPH SERIES

This peer reviewed series contains the results of original research supported by ACIAR, or material deemed relevant to ACIAR's research and development objectives. The series is distributed internationally, with an emphasis on developing countries.

GPO Box 1571, Canberra, Australia 2601.

www.aciar.gov.au

Fleming, Euan and Yala, Charles. 2001. Policy Options for the Tree Crop Industries in Papua New Guinea. Canberra, Australian Centre for International Agricultural Research. Monograph No. 81 211pp.

ISBN 1 86320 305 2 (printed)

1 86320 306 0 (electronic)

Design and Layout: Roar Creative, Canberra, Australia

Printed by: Elect Printing, Canberra, Australia

TABLE OF CONTENTS

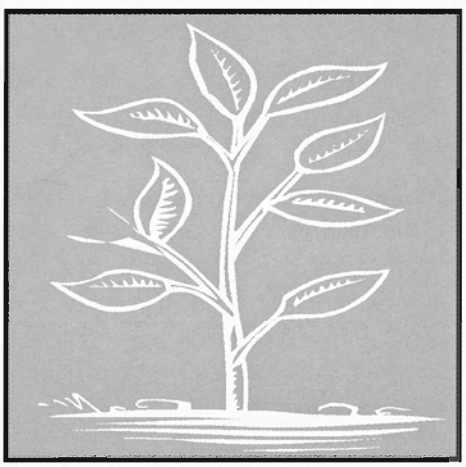
GLOSSARY

ACIAR	Australian Centre for International Agricultural Research
ADB	Asian Development Bank
AGPS	Agriculture Guaranteed Price Support scheme
BPNG	Bank of Papua New Guinea
Cash cropping	crop production primarily for the commercial sale of output
CCRI	Cocoa and Coconut Research Institute
CIC	Coffee Industry Corporation
CMB	Copra Marketing Board
Comparative advantage	employment of resources in the economic activity or activities that maximises efficient allocation at the national level
Competitive advantage	employment of resources in the economic activity that maximises profit at the firm level
DAL	Department of Agriculture and Livestock
Deficiency payment	price subsidy for export commodities that assists producers but does not affect consumers
Didiman	agricultural extension officer
Downstream processing	processing of agricultural output that takes place between the farm gate and the consumer in the marketing system
DPI	(Provincial) Department of Primary Industry
Estate	commercial agricultural business enterprise farming an area of more than 10 hectares of cultivated land
EU	European Union
Freight subsidy	payment made by the government to producers of a portion of the freight cost per unit of agricultural output sold
GATT	General Agreement on Tariffs and Trade now subsumed within the activities of the World Trade Organisation
GDP	Gross Domestic Product
IMF	International Monetary Fund

Income stabilisation	reduction in the variability of income earned by a producer from the sale of a commodity to within some specified range
NSO	National Statistical Office
Nucleus estate	system in which an estate owns and operates the milling facilities and the smallholdings located on land adjacent to the estates are serviced by, and supply output to, the mill
Planting subsidy	counter-cyclical payment by the government to producers for the purpose of encouraging the planting and maintenance of tree crops
Price stabilisation	reduction in the variability of a commodity price paid to producers to within a specified range on a self-funding basis
Price support	the maintenance of a commodity price paid to a producer at or above a specified minimum level
RDB	Rural Development Bank
Semi-subsistence production	production for both commercial sale and own consumption within the household
Smallholding	village-based, semi-subsistence agricultural enterprise, farming an area of less than 10 hectares of cultivated land
Stabex loans	that portion of Stabex payments made by the EU to Papua New Guinea used to provide loans to export industries to overcome the adverse effects of low commodity prices
Structural adjustment	a program of reform entailing macroeconomic stabilisation, trade liberalisation and structural reform initiatives
Subsistence production	production the output of which is used for own consumption within the household or given to other households involving no commercial transaction
Traded goods sector	that sector of the economy producing goods and services that cause a change in the net import or export position
Tree crops sub-sector	sub-sector within the agricultural sector comprising perennial cropping industries, notably coffee, cocoa, oil palm and copra production

PART I

FRAMEWORK FOR POLICY ANALYSIS



CHAPTER 1
THE CONTEXT FOR ANALYSING TREE CROP POLICIES IN PAPUA NEW GUINEA

The main purpose of this introductory chapter is to set the context for analysing policies aimed at developing the tree crops sub-sector in Papua New Guinea. First, an outline is given of the position and role of tree crops in the economy. The approach to assembling empirical evidence on various options for policy making in the tree crops sub-sector is reviewed in section 1.2. In section 1.3, details are provided of a research project undertaken to supplement existing empirical evidence to assess these policy options. After a brief background is given to the project, this section covers the research approach taken, methods used to assemble empirical evidence, and data sources. The chapter concludes with a short section emphasising the importance of smallholders in the sub-sector.

1.1 Tree Crops in the Economy of Papua New Guinea

1.1.1 Agriculture's product contribution in a diversifying economy

Papua New Guinea is a lower middle-income developing country with a small and open economy. Its per capita gross national product was equivalent to US$1150 in 1996 (Economic Insights 1998). Society has traditionally been rural-based although urbanisation has proceeded apace in the post-war period.

The economy in Papua New Guinea has experienced quite a dramatic transformation over the past 50 years along with this urbanisation. It has diversified from an overwhelmingly agricultural economy to one in which the share of gross domestic product (GDP) contributed by agriculture, fisheries and forestry fluctuated between 25 per cent and 33 per cent around a slightly declining trend over the period from 1985 to 1997 (Economic Insights 1998, p. 149).[1] Agricultural GDP grew below the population growth rate at an average of 1.7 per cent per annum during the 1980s.[2] Agriculture's share of economic output will continue to decrease in the long run unless substantial increases occur in smallholder production. Nevertheless, the economy still relies heavily on its agricultural sector despite diversification and low output growth levels, because most people still live in rural areas. Agriculture currently supports about 85 per cent of the population and provides employment for 25 per cent of the workforce in the formal sector (DAL 1995b, p. 2). The sector 'is and has always been of immense importance in Papua New Guinea ... [and] will remain so for a long time' (Shaw 1985, p. 2).

1.1.2 Importance of the traded goods sector

The economic performance of the traded goods sector of a country[3] is obviously of great national importance (Warr 1992). Exports of tradeable outputs contribute most to the performance of the traded goods sector in Papua New Guinea, although food production that substitutes for imports is also important. Tree crops, minerals and energy products are the major exports in Papua New Guinea. Coffee, cocoa, coconut products4 and palm oil dominate commercial agriculture. They contributed K538 million to export earnings during 1996, which was 95 per cent of agricultural exports, 50 per cent of natural resource exports and 16 per cent of total exports (BPNG 1998, p. S33). Export income from coffee in 1996 was about K190 million, followed by palm oil and palm kernel oil (K182 million), copra (K49 million), coconut oil (K51 million) and cocoa (K66 million) (Department of Finance 1997).

Agricultural exports accounted for 46 per cent of total exports in 1984, but their share had fallen dramatically to an historically low average of 12 per cent for the three-year period from 1992 to 1994 (BPNG 1998, p. S33). Admittedly, the 1984 figure was high due to the commodity boom of the mid-1980s and the low figure in the early 1990s was a consequence of abnormally low world prices for tree crop exports. The share recovered to a more representative 25 per cent in 1997 and 1998 (BPNG 1998, p. S33). Despite this recovery, quite a sharp downward trend has taken place in the share of export value contributed by agriculture.

The secular decline in agriculture's share of export value has been largely due to the diversification of the traded goods sector, particularly the growth of the minerals and energy sector over the past two decades. Zeitsch, Fallon and Welsh (1993, p. 13) estimated that a mineral boom, brought about by a 20 per cent increase in the world prices of gold and copper, would lead to declines in output of 2.5 per cent in the coffee industry, 2.8 per cent in the cocoa industry, 0.6 per cent in the oil palm industry and 1.1 per cent in the copra industry.

1.1.3 Role of tree crops in an era of economic reform

Because of its importance in the traded goods sector, the tree crops sub-sector is crucial for economic development in general, and smallholder agriculture in particular. The Department of Agriculture and Livestock (DAL) considers its revitalisation a planning priority, to be achieved primarily by improving profitability and competitiveness (DAL 1995a, p. 9, Setae 1994) in the context of recent economic reforms.

The major component of these reforms is a structural adjustment program that is beginning to have widespread impacts across the economy, including the rural sector. Most of the reforms are directed towards macroeconomic stability, greater economic efficiency and improved competitiveness of industries in the traded goods sector. The major challenge facing the tree crops sub-sector in contributing to the success of the program is to develop mechanisms to maintain comparative advantage and international competitiveness.

1.1.4 Cash cropping

Cash cropping now constitutes more than one-half of total agriculture, dominated by tree crop production, with the remainder being subsistence agricultural output[5] (Fallon 1992). There has always been a reasonably clear distinction between the smallholder and estate sectors in tree crop production in Papua New Guinea. Estates were originally owned and operated by foreign companies, and they were in the vanguard in the introduction of all the major tree crops that are currently produced. Nevertheless, the production of tree crops for cash sale has been the major vehicle introducing rural village-based smallholder households in Papua New Guinea to the cash economy. The post-war period has seen an increasing number of these households developing tree crop plantations, however small, that produce crops destined for export markets.

Except for palm oil, smallholders now produce most of the tree crop output. In 1990, the proportions of households growing tree crops for cash income were 43 per cent in coffee production, 19 per cent in coconut production, 16 per cent in cocoa production, 9 per cent in spice production, 1 per cent in oil palm production and 1 per cent in rubber production (DAL 1995b, p. 1). These proportions are likely to have increased in the intervening decade, particularly for oil palm production.

1.2 Review of Empirical Evidence

Three approaches were adopted to collect empirical evidence on the merits of policy options to develop the tree crops sub-sector. The first approach was to review previous empirical analyses on tree crop production and marketing in Papua New Guinea, and appraise their usefulness in assessing these policy options. Second, there is a lack of empirical evidence in Papua New Guinea for some policy areas, and no prospect of obtaining such evidence. In this case, resort was made to empirical evidence gathered under similar circumstances elsewhere in agriculture in the developing world. Third, a research project was implemented in which

supplementary empirical evidence was obtained for the tree crops sub-sector in Papua New Guinea, using mainly secondary data. The main task in the remainder of this chapter is to describe the work undertaken in this third approach

1.3 Research Project

1.3.1 Background to the research project

The research project was funded by the Australian Centre for International Agricultural Research. It arose from concerns held by the national government of Papua New Guinea about how best to assist development in the tree crops sub-sector. The government has emphasised the importance of tree crop export industries in its recent statements about national development strategies, and acknowledged the need to intervene in their markets to prevent or mitigate the production and marketing problems these industries face. It spent a large sum of public funds on market intervention in tree crop export industries between 1990 and 1994, in the form of price support through the agriculture guaranteed price support (AGPS) scheme to the four major tree crop industries(coffee, cocoa, copra and palm oil).[6] Given the high cost of price support and its unsustainability, along with the demands placed on it as a condition for loans by international agencies such as the World Bank and the International Monetary Fund (IMF), the government recently phased out price support under the AGPS scheme.

With these matters in mind, the government planned to evaluate the benefits and costs of the pre-existing price support schemes. The tree crop industries were to be examined to find alternative means of assistance to replace the AGPS scheme. Research was to be directed at policies that offer most potential to achieve sustainable development in the sub-sector. Such policies were considered necessary if current economic reforms are to be effective. Beginning with existing information available, and augmenting and modifying it where appropriate, studies were to be undertaken of the benefits and costs of alternative forms of assistance. From these studies, it was hoped to provide a comprehensive and consistent set of findings for more informed decisions in agricultural policy making.

Any decision to provide government assistance to tree crop industries depends to a large degree on whether Papua New Guinea has a comparative advantage in tree crop production. The first task in the research project was therefore to test this proposition for smallholders in the four main tree crop industries. A policy analysis

matrix was formulated in which criteria were calculated to measure competitiveness and comparative advantage in these industries (Kannapiran 1999c). The criteria were estimated at both the farm gate and point of export for each tree crop. In each case, estimates were made using market and shadow prices and for the periods prior to and after devaluation of the kina.

1.3.2 Research approach

Objectives

A dearth of information on the effectiveness of past economic policies, and the likely net benefits of promising new policy initiatives affecting tree crop industries, guided the setting of project objectives.

The objectives of the research project were to:

(a) evaluate the economic welfare effects of the recent price support scheme on tree crop industries in Papua New Guinea and the general economy

(b) evaluate alternative means of assisting export tree crop export industries in terms of their impacts on industry incomes in each of the four tree crop industries under study, the distribution of benefits, and overall macroeconomic impact.

It was considered important to assess policy merits in each of these four industries because the case for intervention is unlikely to be equally as compelling across all industries for each selected policy measure.

Research focus

The high cost of the AGPS scheme and its lack of sustainability, particularly in the face of continuing cash flow problems experienced by the national government, provide a focus for policy reform, but this is not the only policy area worthy of study. The impacts of other policies that are in place (price stabilisation, input subsidies, tree crops research, product quality improvement, rural finance, rural public investment and exchange rate manipulation) should be subject to scrutiny. So too should new policy initiatives, especially those to diversify tree crop production systems, conserve natural resources, improve gender relations and minimise market risk while having the potential to increase smallholder incomes on a sustainable basis through the adoption of improved production methods.

It was clearly infeasible to undertake all the empirical work in the research project needed to achieve a full evaluation of policy options. The approach adopted was to

review existing work in each policy area, and complement it by further empirical work where that was seen as feasible and desirable. In all cases of additional work, reliance was mainly to be on data from secondary sources.

The policy measures selected for analysis were:

(1) price support, encompassing perpetual output price support and a modified AGPS for periods of low world prices in the future

(2) a return to pre-existing price stabilisation schemes

(3) diversification of tree crop production systems

(4) manipulation of the exchange rate

(5) subsidisation of inputs in tree crop production

(6) improvements to rural financial systems

(7) raising smallholder productivity on a sustainable basis through investment in research into tree crop production and improvement in extension services

(8) investment in rural infrastructure and services

(9) product quality improvement

(10) other interventions to encourage smallholders to adopt risk management strategies.

These policy options were measured against the base option of no special assistance to tree crop export industries. Analyses were to be undertaken in the event that a return to price stabilisation schemes was concluded to be undesirable. Finally, attention was given to broad areas of public investment that have a significant indirect impact on tree crop industries. They include education and training, health and nutrition, and law and order.

1.3.3 Empirical methods

Six methods were followed in the research project to test the impacts on economic welfare of policy changes designed to assist tree crop producers that might supersede price support:

- econometric modelling of the macroeconomy
- simulation of tree crop production and marketing
- risk analysis of tree crop production

- various partial analyses of production and supply response
- surveys of tree crop commodity markets and producers
- time series analysis of price transmission.[7]

Modelling the economy

The principal analytical method was initially planned to be general equilibrium modelling. A decision was made mid-project to replace this method with two separate approaches: construction of a macroeconometric model of the economy of Papua New Guinea, with a special focus on the tree crops sub-sector, and bioeconomic models at the industry level. There were three chief reasons for changing the methods used. The first was concern about the difficulties of getting meaningful results from a general equilibrium model that would almost certainly contain many unsubstantiated parameters. This concern could have been assuaged to some extent by the use of sensitivity analysis, but sensitivity analysis is limited in its effectiveness when trying to account for the sensitivity of results to large numbers of dubious parameters. Second, the nature of tree crop industries demanded that special attention be given to the biological nature of production. This should not be viewed as a mutually exclusive concern in that bioeconomic aspects can be linked into a general equilibrium modelling approach (e.g. Trewin, Menz and Grist 1998). But time and circumstances did not permit the simultaneous development of a set of bioeconomic models and improved specification of parameters in a general equilibrium model.[8] Third, the strength of linkages between the tree crops sub-sector and the macroeconomy probably did not warrant the additional costs of a general equilibrium approach (e.g. Hertel 1990), beyond what could be achieved by developing a macroeconometric model. Both approaches enabled estimates of efficiency changes of alternative policies in the four tree crop industries. A macroeconometric model was successfully constructed, and a series of macroeconomic simulations was undertaken to measure the changing impacts of the tree crop industries on the economy (Kannapiran 1999a,b).

Bioeconomic models

Bioeconomic models at the industry level were constructed for each of the four tree crop industries to measure the direct welfare impacts of policies (Fleming 1999e). The main outputs of the models were estimates of economic surplus on an industry basis, measured using present discounted values (Fleming and Milne 1999, Fleming 1999e). The simulation work consisted of a number of modules for each of the four tree crops, and separate models for smallholders and estates. The modules cover the

calculation of areas planted to trees (by different age groups of trees and their yield potential), output, exports (volume, price formation and value), break-even values, and estimation of the present value of economic surplus at either the farm gate or factory door.

Risk analysis

Third, the ®Risk software was used in a special case study to examine the economic impact of a research innovation in coffee production in a risky environment (McLaren 1999). The original aim of this study was to demonstrate how diversification combined with technological improvement could lead to a more efficient tree crops-based farming system. The proposition to be tested was that tree crop producers have at their command a powerful means of implementing their own income-stabilising measures. The impact of the technological improvement was successfully evaluated, but not the inter-related impact of diversification because suitable data were lacking. Stochastic dominance criteria were used for assessment.

Analysis of production and supply

Fourth, a number of partial analyses of production and supply response were undertaken (Fleming 1999a,b, McLaren and Fleming 1999, Milne, Coelli and Fleming 1999, Ruhle and Fleming 1999). These analyses were primarily designed to yield parameters used in the simulation models, but some contributed insights into activities in tree crop production independently of the simulation models, notably supply response to a devaluation. Also, a stochastic production function analysis yielded information on the technical efficiency of production and scope for productivity gains from efficiency improvements (Overfield and Fleming 1999).

Transport and accessibility surveys

Fifth, surveys were undertaken on accessibility and its effects in the coffee and oil palm industries (Yala, Igitoi and Lummani 1999). The main aim of these surveys was to assess the impact of distance of small producers from markets and factories on competition in the market-place, the profitability of their operations and their willingness to supply tree crop products to the market.

Analysis of price–quality relationships

Finally, two studies were made of price–quality relationships in the coffee industry (Degemba and Fleming 1999, McConnell, Rambaldi and Fleming 1999). Time series analysis techniques were used for this purpose.

Assessment of analytical methods

The bioeconomic models and other methods of partial analysis are not as all-embracing nor as analytically powerful as general equilibrium modelling. However, it was felt that they had the considerable merit that they can be much more easily understood and used on a regular basis by staff in the collaborating institutions in Papua New Guinea. The simulation models can also be tailored better to capture the dynamics in growth and condition of tree stocks over time. In this respect, it was expected that project output would be valuable in providing a basis for institutional development and demonstrating where data deficiencies are most binding, detailed by Fleming (1999f).

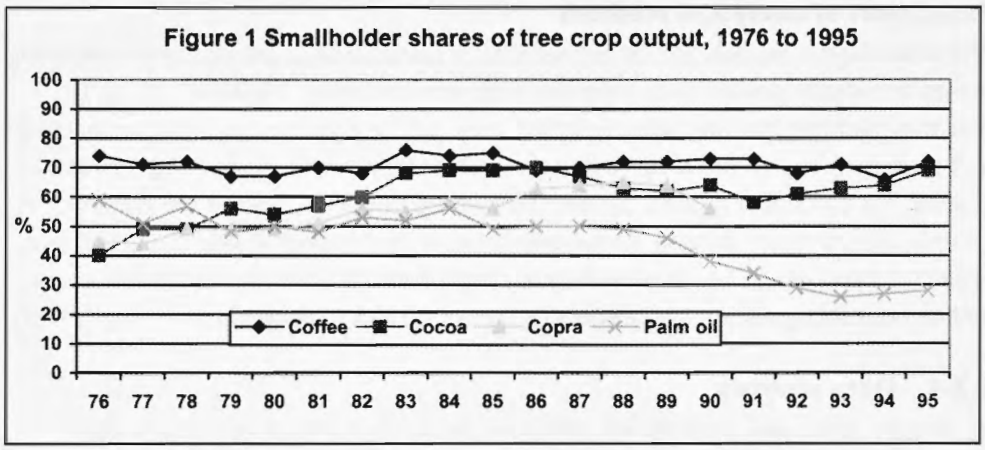
1.3.4 Data sources

Secondary data were used to model the macroeconomy. Both secondary and primary data were used to carry out partial equilibrium analyses in the research project, but with an overwhelming dependence on the former. This course was followed even though existing data sources are partial and possibly unreliable. To undertake a full production, income and expenditure survey, for example, would have been prohibitively expensive and, even then, would not have ensured accurate estimates if past such studies in Papua New Guinea are any guides.

1.4 Smallholder Orientation

Smallholders produce the bulk of tree crop exports in Papua New Guinea and are the main target of government policy (World Bank 1997, Setae 1994). Some 468 000 households (about 80 per cent) of the estimated 574 000 households produce these crops (DAL 1995b, pp. 4-11).

The proportions of values of the four major tree crop exports contributed by smallholders in the period from 1976 to 1995 are presented in Figure 1. The share of coffee output contributed by smallholders was consistently around 70 per cent during the study period. Smallholders' share of cocoa output was similar to that for coffee in the second half of the period after increasing quite rapidly during the first half of the period. The share of smallholder contributions to copra output followed a similar path to that for cocoa until 1989. Separate data became unavailable for smallholders and estates by 1991, but it is expected that the relative contribution of shareholders continued to increase during the 1990s. In the mid-1970s, smallholders were supplying more than one-half of the output of palm oil, but this proportion declined throughout all but the final two years of the study period, when a slight upturn can be observed in Figure 1.



Sources: coffee (World Bank (1992), NCDS (1995), Kuimbakul (1996), Stapleton, Alu and Wheeler (1999); cocoa(Fleming (1999c, Figure 9); copra (World Bank (1992); palm oil (NSO (1979), World Bank (1992), OPIC (1996).

---

1 This decline was accentuated by high world commodity prices in the mid-1980s and low world commodity prices in the early 1990s.

2 The accuracy of agriculture's growth rate is dubious given the inability to measure food production accurately, especially food produced for subsistence purposes. The extent of the inaccuracy is limited to some extent by assuming a constant relationship between subsistence output and population.

3 Tradeables comprise 'goods and services whose use or production causes a change in the country's net import or export position' (Perkins 1994, p. 145). Tradeable outputs are exported, substitute for other goods that are exported, or substitute for imports. Tradeable inputs are imports, substitutes for imports, or exportables, which are inputs that could have been exported had they not been used as inputs in domestic production (Perkins 1994, p. 150).

4 Copra and coconut oil are the two most important of many coconut products.

5 Subsistence output is defined as output produced for the purpose of direct consumption within the household that produced it or given to other households involving no commercial transaction. Most subsistence output derives from food production.

6 Estimates vary, from K261.5 mn by Kannapiran (1999d, p.32) to K271 mn by DAL (1995a, p. 16).

7 The results of these studies are reported in a series of occasional papers, listed by Fleming (1999, Appendix 1), that are referred to on many occasions in the chapters that follow. The authors of these papers contributed substantially to the views expressed in this report, and their contributions are gratefully acknowledged.

8 The improved specification of parameters in the existing general equilibrium model, and incorporation of the bioeconomic aspects of tree crop production in that model, should remain a long-term aim of tree crop policy analysts in Papua New Guinea. Given that assistance to one sector imposes costs on other sectors, a general equilibrium analytical framework will always be important for policy makers concerned with decisions made in the traded goods sector.

CHAPTER 2
INDUSTRY BACKGROUND AND POLICY FRAMEWORK

This chapter commences with some brief background notes on the four main tree crop industries. The policy framework is then described in terms of the macroeconomic policy setting (section 2.2) and the agricultural sector planning and policy environment, with specific attention to tree crop policies (section 2.3). In section 2.4, an assessment is made of the case for continued policy assistance to tree crop industries.
The chapter closes with an overview of policy options in the tree crops sub-sector.

2.1 Industry Background

2.1.1 General observations

Recent economic trends

The most significant economic trends affecting the tree crops sub-sector in the past decade have been in the commodity export markets and the foreign exchange market. The f.o.b. export prices of all main tree crop exports collapsed in the late 1980s (BPNG 1998). Producer prices were maintained to some extent by the introduction of support prices under the AGPS scheme. The export markets recovered somewhat from 1994 and more favourable international commodity prices prevailed, resulting in increased f.o.b. export values. Devaluation of the kina since September 1994 has increased export prices in kina, and improved the international competitiveness of tree crops (Kannapiran 1999c).[9] In the early years of the AGPS scheme, however, producers may not have felt much benefit from the devaluation as producer prices were already above f.o.b. export prices because of the price support.

Concerns have been expressed about the long-term trends in all tree crop world prices, but it is doubtful whether anyone can accurately predict these trends. The stance adopted in this study is to assume that current prices, which are neither very high nor very low, are a reasonable approximation of the future.[10] Even with this scenario, it appears that area expansion, improved productivity and diversification of production will be required for sustainable growth in the future (DAL 1995b, p. 1).

Scope to increase production

Smallholder production of cash crops, except for oil palm, is characterised by relatively low levels of technology, yields and income, despite favourable climatic and agronomic endowments (World Bank 1992). This is a major factor in the stagnation of tree crop production in recent times, and is partly due to the high-cost structure from government intervention in the factor markets that has at times discouraged production (Fallon 1992).

The maintenance and replanting of smallholder tree crops virtually stopped between 1989 and 1993, consequently running down plantation and processing assets (Grey 1993). However, replanting has recommenced with improvements in commodity prices. Scope exists for increased tree crop production through an expansion in areas of plantations and increased productivity, as well as through the adoption of more favourable agricultural policies. Further significant expansion of areas of plantations will be subject to infrastructural improvements that improve accessibility to markets.

A brief account is now given of recent trends and events in the four major tree crop industries, commencing with coffee. Important institutions in these industries are also briefly described.

2.1.2 Coffee

Coffee production and export performance

Coffee is the most important export crop in Papua New Guinea in terms of the number of households participating in production and the value of export earnings. Coffee exports currently account for around 40 per cent of total agricultural export earnings (BPNG 1998, p. S33). Smallholders produce about 80 per cent of coffee exports (Stapleton et al. 1999).

Export volumes and values of coffee for the period from 1976 to 1998 are presented in Table 1.[11] Values are shown in US dollars in 1998 prices. The period began with historically high values of coffee exports in the midst of a world commodity boom. A marked downturn in world market conditions ushered in a major decline in the value of coffee exports such that, by 1982, export values were US$139 m, less than one-half their value in 1977. World market conditions were again the dominant force influencing export values in the 1980s, with another peak in export values in 1986 (US$282 m), followed by a decline for the remainder of the decade. Coffee output increased at a rate of 2.5 per cent per annum during the period from 1979 to 1990.

Export values remained depressed from 1990 until 1994 when they increased to US$179 m following the introduction of higher support prices in 1992, improvements in world market conditions and good weather in 1994 (DAL 1995b, p. 5). Although the severe drought of 1997 (Allen and Bourke 1997, Levantis and Gani 1998, p. 90) set back production, Stapleton et al. (1999, p. 13) reported a record level of exports of green beans above 80 000 tonnes in 1998.

Coffee yields vary widely, with estate yields generally well above those of smallholders. Yet they also differ markedly among smallholders, from around 200 kg/ha to 1.5 t/ha (Fleming 1999c).

Kannapiran (1999c) reported a strong comparative and competitive advantage in smallholder coffee production.[12] The future of the coffee industry depends on producers remaining competitive in a climate of volatile world prices and the threat of disease. Given currently low husbandry standards of smallholders, there is scope for improving yields and incomes by improvements in technical efficiency (Overfield and Fleming 1999) and the introduction of minimum-cost labour-intensive maintenance activities (World Bank 1988).

Coffee export prices

Export prices of the tree crop products, calculated as f.o.b. prices measured in 1998 US dollars, are presented in Table 2. Nominal prices in kina for the 34-year period 1965–98, were initially calculated as export unit values using data, reported above, on export volumes and values for the period 1976 to 1998.[13]

The general trend in average annual f.o.b. export prices of coffee over the study period has been downward, but marked by cyclical peaks in the middle of each decade (Fleming and Antony 1993, pp. 6–10). An extended period of low world prices, together with the liquidation of stocks that had been accumulated in anticipation of a new International Coffee Agreement, led to a fall in world prices in the late 1980s (Grey 1993). Export prices were abnormally low during the early 1990s, even allowing for a long-term downward price trend. They fell to just US$1348/t in 1992. A moderate recovery of prices took place from 1994 but, recently, prices have once again declined to particularly low levels as part of their market cycle. The New York price for other mild arabicas reported by ICO (2001) on 24 April 2001 was equivalent to just US$1483/t.

Coffee institutions

The Coffee Industry Corporation (CIC) was established by an Act of Parliament in 1991. Its predecessors were the Coffee Marketing Board (established in 1963) and the PNG Coffee Industry Board (established in 1976). The CIC board comprises grower representatives, representatives exporters and processors, and representatives relevant government departments.

Table 1

Estimated Export Volumes and Values of Coffee, 1976 to 1998

Year	Export volume (t)	Export value (US$ m)
1976	48 144	270.8
1977	36 965	356.1
1978	45 801	270.7
1979	49 586	262.6
1980	50 989	222.2
1981	46 980	140.0
1982	44 340	138.8
1983	46 140	158.1
1984	57 180	176.1
1985	39 480	169.8
1986	52 140	282.4
1987	68 160	177.9
1988	44 760	149.2
1989	79 020	178.9
1990	63 120	110.5
1991	47 280	86.4
1992	54 840	71.4
1993	63 360	108.8
1994	69 480	179.0
1995	60 120	151.1
1996	65 160	135.3
1997	62 820	227.2
1998	80 880	218.6

Source: Fleming (1999c, p. 30).

CIC performs important regulatory and facilitatory functions in the industry. It is financed from internal sources and by government contributions and levies on industry members (CIC 1994). CIC (1994, p. 20) listed its main functions as 'the control of coffee dealing activities, registration of coffee exporters and processing facilities, quality control, control of exports and promotions of sale and consumption of PNG coffee at home and abroad'.

Activities of the extension arm, the Coffee Development Agency, and the research arm, the Coffee Research Institute, were traditionally financed by industry levies. These two bodies were merged with the Coffee Industry Board on the establishment of CIC.

2.1.3 Cocoa

Cocoa production and export performance

Grown by 93 000 households in the tropical coastal and island regions, cocoa is currently the third most valuable export crop in Papua New Guinea. It was the second most valuable export crop until 1990 when it was surpassed by palm oil (Fleming 1999c). Cocoa exports averaged just 10 per cent of total agricultural export earnings in the years 1997 and 1998, compared with 23 per cent in 1980 (BPNG 1998).

Cocoa was first introduced in Papua New Guinea in the late 19th century. Development was slow, with exports beginning in 1905 and reaching only 323 tonnes by 1950–51. The Department of Agriculture made a successful effort to expand the cocoa industry in the post-war period (ACIAR 1987), and output peaked in the late 1980s and early 1990s at around 30 000 tonnes. This was before the advent of civil strife in Bougainville, associated with attempts to secede, and the eruption of the Rabaul volcano in East New Britain in 1994. These events reduced output levels to approximately 20 000 tonnes per annum. Papua New Guinea now exports about one per cent of world cocoa exports, compared with a peak of nearly 2 per cent of world output in the early 1980s.

Cocoa production is highly concentrated in a few provinces, with East New Britain and North Solomons accounting for about 80 per cent of supply over the past few decades (Coulter 1996). In recent years, this share has dropped to 63 per cent with East New Britain alone contributing over 50 per cent of all production in 1994–95 (Peter 1996). New Ireland (10 per cent), Madang (9 per cent), East Sepik (8.5 per cent) and Northern (3.5 per cent) are other major cocoa-producing provinces (Peter 1996).

Table 2

Export Prices of Tree Crops, 1965 to 1998

Year	Coffee	Cocoa	Copra	Palm oil
1965	4846	2026	977	n.a.
1966	4500	1492	918	n.a.
1967	4476	2512	768	n.a.
1968	4448	2944	1053	n.a.
1969	4325	3817	875	n.a.
1970	4160	3061	832	n.a.
1971	4433	2201	860	n.a.
1972	3622	2109	536	746
1973	3571	3261	482	678
1974	2995	3592	1102	1047
1975	2601	2675	864	1053
1976	4919	3448	384	668
1977	8268	7066	651	869
1978	6240	5990	631	917
1979	4336	4527	882	861
1980	4825	3094	506	673
1981	3078	2331	370	610
1982	3167	1998	307	503
1983	3153	2495	504	509
1984	3226	3124	832	927
1985	4068	2922	468	720
1986	5248	2395	146	297
1987	3018	2158	238	325
1988	3295	1630	332	422
1989	2298	1236	294	371
1990	1670	943	168	245
1991	1790	1032	128	286
1992	1348	925	259	300
1993	1602	930	272	341
1994	2766	974	255	294
1995	2743	1098	301	537
1996	2173	1149	351	486
1997	3838	1331	365	525
1998	2939	1437	322	602

Source: Fleming (1999c, p. 38).

Average cocoa yields vary widely. This has been especially so for smallholders, with very low yields on poorly maintained plots but quite high yields in well-maintained hybrid planting areas (Fleming 1999c). The latter yields are high by international standards even with low levels of fertiliser use (Opa 1991). Initially, it was thought that the introduction of high-yielding hybrid varieties would improve yields, industry competitiveness and product quality, even at low world prices (World Bank 1988). However, the first generation of hybrid trees yielded disappointingly despite initially promising results (Fleming 1999c).

Cocoa export volumes and values for the period from 1976 to 1998 are presented in Table 3.[14] There has been a large change in the sectoral composition of cocoa output. Estates dominated production until the mid-1960s. With the growing importance of cash crops among smallholders, however, the relative contribution by the estates has declined to around one-third of total cocoa exports (see Figure 1). Record output levels were reached in 1989 as a result of new plantings, but output then trended downwards until 1994 in which year it was 56 per cent of the 1989 figure. Since then, output has picked up with improved market conditions (BPNG 1998, p. S39).

Estate output has declined markedly since peaking in 1974/75 (Peter 1997). This was primarily due to the limited amount of replanting by estates in recent times and disappointing performance by hybrid varieties used in replanting by most estates in the early 1980s. The extent of the failure of these early hybrids to maintain yields as the trees aged can be gauged from the fact that estate output halved between 1988–89 and 1994–95 (Peter 1997).

The smallholder proportion of output had grown to around one-quarter by the end of the 1960s, to more than one-half by the end of the 1970s, and to 70 per cent by 1985–86 despite frequent experiences of unfavourable production conditions. Smallholder output has since stagnated, leading to an initial decline in its relative contribution to total output when estate production increased rapidly because of the early boost in yields in areas replanted with hybrids some years earlier. The proportion of total output supplied by smallholders had almost regained its 1985–86 level by 1994–95, due chiefly to the decline in estate output. Smallholders currently produce 65 to 70 per cent of cocoa output (Figure 1). Factors causing variations in output include climatic conditions, such as bad weather and prolonged drought, price fluctuations, unreliability of marketing infrastructure and marketing institutions in more remote cocoa-producing regions, the effects of the Bougainville crisis[15] and disease (DAL 1995b, p. 6, Peter 1996).

Kannapiran (1999c) reported a strong comparative advantage in smallholder cocoa production. The same is largely true for competitiveness, but there are times when low international prices make smallholders temporarily uncompetitive.

Cocoa export prices

Analysis of average annual f.o.b. export prices of cocoa over the period 1965 to 1998, presented in Table 2, can be usefully divided into two sub-periods. For the first two decades of the study period, export prices fluctuated substantially with a number of peaks and valleys at fairly regular intervals. Since then, they have been less volatile, but at relatively low levels. Prices reached an historically low level in real terms in the third quarter of 1992 (BPNG 1998, p. S38). They then gradually increased to US$1437/t by 1998 but subdued market sentiments resulted in a halving of price between January 1998 and December 2000. Since then, there has been an upsurge in the market, and prices reached almost US$1000/t by 19 April 2001 (ICCO 2001).

Cocoa institutions

The Cocoa Board of Papua New Guinea was established in 1974 as 'a regulatory body with powers to license processors, dealers and exporters and to carry out investigations and physical inspections of marketing facilities and cocoa quality' (Yarbro 1988, p. 1). It does not participate directly in the marketing of cocoa, which is undertaken by private companies, but operated the Cocoa Stabilisation Fund until its exhaustion in 1989. A move was made in the early 1990s to corporatise the Board and alter its functions, along the path followed in the coffee industry. Coulter (1996) argued against the move, stating that the Board had for many years proven it could operate successfully. The Board has not yet been corporatised, and its functions remain unchanged.

Cocoa research activities have been carried out by the Cocoa and Coconut Research Institute (CCRI) since they were transferred to the Cocoa Board from the public sector in 1986. The Cocoa Board and Copra Marketing Board jointly fund these activities, supplemented by contributions from the national government.

Table 3

Estimated Export Volumes and Values of Cocoa, 1976 to 1998

Year	Export volume (t)	Export value (US$ m)
1976	31 321	105.7
1977	29 419	214.3
1978	27 129	159.1
1979	28 084	127.9
1980	28 792	87.1
1981	27 183	64.4
1982	28 223	56.7
1983	25 954	69.1
1984	33 568	106.6
1985	30 427	90.3
1986	30 510	76.4
1987	34 297	74.2
1988	37 142	60.4
1989	46 340	57.6
1990	35 813	32.0
1991	35 151	36.9
1992	38 438	35.8
1993	35 919	35.8
1994	31 902	25.3
1995	29 078	33.6
1996	39 299	47.1
1997	38 600	51.1
1998	30 300	43.1

Source: Fleming (1999c, p. 33)

2.1.4 Copra

Copra production and export performance

Copra is a traditional tropical island cash crop that is now being intercropped increasingly with cocoa in Papua New Guinea. Production levels have suffered two major downturns over the past decade: low international prices until recently, and the consequences of the volcanic eruption in East New Britain in 1994 (DAL 1995b, p. 6).

The volumes and values of exports of copra and coconut oil for the period from 1976 to 1998 are presented in Table 4.[16] Volumes of copra exports tended to fluctuate around a slightly declining trend while coconut oil exports increased over the study period. The value of copra exports increased sharply during the late 1970s then declined just as sharply in the early 1980s. It stagnated for a decade after a brief rally in 1983–84, then recovered briefly in the mid-1990s before falling back in 1998 (whereas coconut oil exports held up in 1998 following this recovery). World market conditions have been the dominant influence on values, with a minor positive influence from supply response, against a backdrop of climatic fluctuations and gradually declining yields with ageing palms.

Kannapiran (1999c) expressed grave doubts about the current and future competitiveness of smallholder copra production, and the same doubts no doubt exist for the estate industry. Much will depend on future world copra prices and the non-export advantages of coconut production that were not included in the analysis by Kannapiran (1999c). Any growth of copra production in the future will probably be based on the continued successful intercropping of coconut palms with cocoa trees. This should keep costs low for both crops and maintain returns to labour (World Bank 1988).

The average annual f.o.b. export prices of copra[17] are presented in Table 2 for the period from 1965 to 1998. They can be usefully divided into the same two sub-periods as for cocoa, with widely oscillating prices until the mid-1980s and fairly stable but low prices since then. As for coffee, the long-term trend in prices is downward although a mild recovery was experienced after the nadir of US$128/t in 1991.

Table 4

Estimated Volumes and Values of Copra and Coconut Oil Exports, 1976 to 1998

Year	Copra		Coconut oil	
	Volume (000 t)	Value (US$ m)	Volume (000 t)	Value (US$ m)
1976	85.7	32.7	25.5	22.2
1977	87.7	57.1	29.7	31.3
1978	92.2	58.1	29.1	31.3
1979	90.9	80.2	30.8	43.3
1980	90.8	45.9	34.1	31.1
1981	99.4	36.4	34.8	23.6
1982	74.4	23.0	37.6	21.6
1983	78.7	40.1	36.2	33.4
1984	93.5	78.1	40.7	62.7
1985	103.5	48.3	41.5	34.2
1986	93.0	13.5	41.1	14.1
1987	84.1	20.1	40.2	19.1
1988	76.8	25.5	36.3	22.9
1989	60.7	17.8	34.6	19.5
1990	55.3	9.3	34.8	12.4
1991	44.0	5.6	33.2	13.9
1992	47.5	12.4	34.8	25.4
1993	59.0	15.4	45.5	21.2
1994	50.3	12.8	34.7	17.6
1995	64.2	19.3	33.1	20.9
1996	99.2	34.8	49.6	36.6
1997	90.3	32.9	48.6	35.6
1998	57.6	18.2	53.3	33.3

Source: Fleming (1999c, p. 35).

Copra and coconut oil export prices

Export prices were poor from 1984 until 1995, given heavy supplies onto the world market and the growing availability of substitute oils. Copra prices have improved in real terms in recent years, from below US$200/t in 1990 and 1991 to around US$350/t in the three years from 1996 to 1998 (Table 2). They peaked at US$365/t in 1997. This recovery was in part attributable to lower production levels in the major producing country, the Philippines. Long-term market prospects, however, are not especially bright.

Coconut institutions

The Copra Marketing Board has long been established as the only buyer and exporter of copra, commencing operations in 1954. It either exports copra directly from its branches or trans-ships from sub-branches to the branches that can export (Simmons and Anoser 1993, p. 3). The Board pays a common depot price of copra at its branches and sub-branches based on a formula using the f.o.b. export price and including various deductions for internal marketing costs, a research levy and margin (see Simmons and Anoser 1993, p. 7). Private marketers operate between the farm gate and the depots of the Copra Marketing Board (Yarbro 1992).

Responsibility for coconut research was transferred to the Copra Marketing Board from the public sector in 1986, since when it has been carried out by CCRI. As for cocoa, coconut research activities of CCRI are jointly funded by the government and the industry boards.

2.1.5 Palm oil

Oil palm production and export performance

Oil palms have been cultivated in Papua New Guinea since 1967. Estate production, in particular, has continued to increase over the past 15 years, due primarily to plantings through development projects, to make palm oil the second most important export crop.

The volumes and values of exports of palm oil for the period 1976 to 1998 are presented in Table 5.[18] The period of major development of the industry took place from the mid-1970s to the mid-1980s, with the value of exports increasing from US18 m in 1976 to US$120 m in 1984. High export prices in the mid-1980s accentuated the impact on export values of the development of plantations. The period from 1985 to 1990 was one of initial rapid decline, caused by a fall in export prices, then stagnation. Values recovered in the 1990s, reaching US144 mn in 1997 with increases in both export prices and volumes. Despite falling prices, record

export volumes were produced in 1994 when palm oil exports contributed 21 per cent of the total agricultural export earnings. This proportion reached an average of 26 per cent for the two years, 1997 and 1998 (BPNG 1998), as record outputs continued to be achieved.

Comparative advantage and competitiveness are strong in both smallholder and estate oil palm production (World Bank 1992, Annex 3, p. 16, Kannapiran 1999c). There is great potential for further development given modern mills and marketing facilities, and good-quality planting materials. Although estate yields are still much higher than those for smallholders, the high returns to oil palm production have attracted many applicants to the smallholder schemes (World Bank 1988). Most smallholders in early projects participated in land settlement schemes whereas local villagers have been the only smallholders participating in recent projects.

Palm oil export prices

The average annual f.o.b. export prices of palm oil are presented in Table 2 for the period from 1972 to 1998. They more than halved over the second half of the 1980s, reaching their lowest point of US$245/t in 1990. Recovery in the world market was slow for the first half of the 1990s, with the price rising to just US$294/t by 1994. But the pace of recovery quickened during 1995, and the price had reached US$602/t by 1998. Prices have again declined in recent times, falling two-thirds from their record levels of 1998 to US250/t in January 2001 (Anon. 2001, p. 112).

Oil palm institutions

The oil palm industry was developed under the management of DAL until 1992. The Oil Palm Industry Corporation was established in 1992 as a statutory body responsible for the provision of extension services to smallholders. There are project offices in each oil palm-growing province while the head office is located in Port Moresby. Each project office has divisions operated by a divisional manager and extension officers (Yala et al. 1999, p. 8). The Corporation is funded by a levy on producers.

The Oil Palm Industry Corporation acts as an intermediary between smallholders and the oil palm milling companies (Yala et al. 1999, p. 8). Its main role is to generate and provide information, technical advice and extension services to the smallholders.

Research activities are funded primarily by a levy on producers, although the industry has received some research funding from the national government. The PNG Oil Palm Research Association is responsible for planning and funding the research work.

Table 5

Estimated Volumes and Values of Palm Oil Exports, 1965 to 1998

Year	Volume ('000 t)	Value (US$ m)
1976	27.3	18.4
1977	24.5	21.4
1978	28.4	26.5
1979	34.5	30.2
1980	33.3	22.5
1981	44.0	26.8
1982	76.7	38.7
1983	77.9	39.6
1984	129.9	120.4
1985	123.8	89.0
1986	129.0	38.3
1987	97.3	31.6
1988	102.6	43.2
1989	131.7	48.8
1990	142.7	35.0
1991	199.6	57.0
1992	206.1	67.3
1993	245.7	85.8
1994	230.8	67.7
1995	186.6	100.2
1996	267.0	129.7
1997	274.9	144.4
1998	229.6	136.0

Source: Fleming (1999c, p. 37).

There are five established estates with milling facilities. The three older projects are in Bialla, Hoskins and Popondetta provinces and the two new projects are in New Ireland and Milne Bay provinces. The Hoskins project is the oldest, largest and most successful oil palm scheme in the country, involving more than 3000 smallholder households (Yala et al. 1999, p. 10). Ownership of these projects entails joint ventures with private foreign companies, the national government, provincial governments and landowners.

A lease–lease-back system is used whereby the estate developers buy land from the local landowners for oil palm cultivation. The lease is normally for 20 years with an option of a second 20-year period. Under this arrangement, the landowners receive royalties for the harvested fruit paid on a monthly basis according to an agreed formula (Ellingson and Burnett 1998, Yala et al. 1999, p. 8).

The organisational structure of the oil palm industry differs appreciably from that of the three tree crop industries described above. It is a nucleus estate system in which the estates own and operate the milling facilities and the smallholdings are located on land adjacent to the estates. As owners of the mills, the estates purchase fresh fruit bunches directly from the smallholders, and provide inputs and services to the smallholders as part of the contractual arrangements of the nucleus estate system (Yala et al. 1999, p. 10).

Smallholder oil palm expansion has been promoted through two types of schemes (Ellingson and Burnett 1998, p. 3). The first type is the land settlement scheme where the growers are settlers brought in from other parts of the country. These smallholders generally have access to six hectares of land of which four hectares are planted to oil palms and the remaining two hectares are used to grow food crops. Second, the village oil palm smallholder scheme comprises local inhabitants growing oil palms, normally on two hectares of customary land.

2.2 Macroeconomic Policy Setting

2.2.1 Fiscal policy

Fiscal incentives

Current key fiscal incentives in Papua New Guinea are summarised by Economic Insights (1998, pp. 122–123). Tax policy has traditionally favoured the agricultural sector over the non-agricultural sector in Papua New Guinea. According to Uppal (1994, p. 39):

The overall tax burden on agricultural producers is very low. Taxes paid by growers contribute only a minor portion of the total tax revenue. In a macro sense, policies favouring low taxes create incentives for investment by producers without causing the government any serious loss of tax revenue.

Taxation benefits for agriculture include double deduction of export development costs, depreciation deductions of up to 100 per cent in the first year, indefinite carry forward of losses and exemptions from import duties. Estates are able to write off a very high proportion of their expenses, estimated by Uppal (1994, p. 18) at 97 per cent, which is higher than the proportion for non-agricultural firms (91 per cent).

Export taxes

An agricultural export tax has been imposed on the basis of a formula in which a trigger price is set on a 10 year moving average of f.o.b. export prices (Uppal 1994, pp. 20–21). The export tax rate since independence has been no more than 2.5 per cent of prices (Jarrett and Anderson 1989). When applied, the tax is high relative to what is paid by other income earners, but is not applied when commodity prices are low. As the major producers, smallholders have paid the bulk of this tax (Shaw 1985, p. 148). According to Uppal (1994, p. 38), however, this is the only significant way in which the government can obtain revenue from smallholders who pay no income tax and little in the way of duties on imported farm inputs.

Export taxes ceased being levied on agricultural producers in 1989 following a period of consistently low world commodity prices below the level of the trigger.[19] They have been suspended since 1991 (Uppal 1994, p. 28). The government introduced a framework for trade policy reform in 1992 designed to eliminate export taxes except on logs and unprocessed shells (Duncan, Warner and Temu 1995).

Import taxes and duties

The government maintained open trade policies with low import and export taxes until the early 1980s. From the mid-1980s, increasingly more interventionist policies were introduced to meet revenue, distributional and protection objectives. Selective import bans and duties created an incentive structure with high levels of effective protection for a limited group of activities but effectively negative rates of protection for agriculture (Duncan et al. 1995).

The rate of import duties on farm inputs has always been quite low. It rose from 8 per cent in 1980 to 12 per cent in 1985. In 1986, most imported goods were subject to a general levy of 7.5 per cent plus additional duties. As a result, internal

revenue increased substantially, contributing around 22 per cent of the budget by the mid-1980s (Jarrett and Anderson 1989, p. 51).

In its framework for trade policy reform in 1992, the government aimed to phase out quantitative import restrictions and adopt a more uniform import duty structure. The target duty structure comprised a uniform 10 per cent rate except for duty on imports of capital goods, inputs into the production of exports and a number of 'essential' consumer goods.

By 1998, the basic rate on raw materials and manufactured goods was 11 per cent, compared with an intermediate rate of 40 per cent, and rates of 55 per cent and 75–125 per cent, respectively, on final and prohibitive goods (Economic Insights 1998, p. 121). In 1988, import duties raised just K2.5 million, or 1.1 per cent of total government revenue (Uppal 1994, p. 28), and still account for a very small proportion of the costs of tree crop producers, especially smallholders.

Import bans have been applied in an endeavour to raise self-sufficiency levels for certain foodstuffs, by expanding domestic food production and encouraging the development of new industries such as sugar, which was protected by a 50 per cent tariff until recent reforms (Economic Insights 1994, p. 91). In the case of sugar, the producer price has historically been about twice the export price, hindering the development of secondary sugar-using industries (DAL 1994, pp. 29–30).
The 1993 budget contained a general 3 per cent levy on imported food and a further 2 per cent levy on rice and grains. As a follow-up measure, the government established a grain and rice development program in the 1994 budget, to facilitate import substitution (Economic Insights 1994, p. 91).

The government has indirectly increased domestic prices and costs in other industries. Import bans on fruit and vegetables have been in place since 1986 with total bans on fresh vegetables occurring in 1990 (Food Management Division 1995). DAL claims that the bans have encouraged local production and reduced the level of imports, but high transport costs, unsatisfactory extension services and low management skills are still major constraints to progress (World Bank 1988). Attempts are being made to address these constraints through the Marketed Fruit and Vegetable Programme (DAL 1995a, pp. 6–7).

In 1991, the World Bank encouraged the removal of import levies on 344 items. The 1991 budget recommended that tariffs replace all existing bans but this did not occur immediately (Economic Insights 1994). The issue of tariffication has since been

addressed as part of the requirements for membership of the World Trade Organisation (Food Management Division 1995).

Certain domestic and external trade restrictions were marked for removal in the 1995 budget. These restrictions included import and export licensing for rice, sugar, fresh fruit and vegetables, entry barriers for agricultural processing and marketing, and import bans. A three-year timetable was set to reduce tariffs (Food Management Division 1995).

Value-added taxes

Broadening the tax base has long been recommended as a way to reform the tax system (for example, Thac and Lim 1984). The concept was given an impetus in 1994 when the World Bank recommended a value-added tax be introduced as part of the current structural adjustment program (Yala and Levantis 1998, p. 15). A value-added tax of 10 per cent was finally introduced in 1999. The aim of its introduction was to create a more efficient incentive structure and remove distortions that favoured manufacturing industries over agriculture and other export industries (Economic Insights 1998, p. 120).

Economists at CIC expressed concern about the 'deemed input credit', which did not appear to be paid to smallholder coffee growers, and the possibly flawed basis on which it was calculated. They made a submission to this effect to the Taxation Review (Gerard Stapleton, CIC, personal communication, 2000).

Provincial sales taxes were also to be removed in the 1999 tax reforms (Economic Insights 1998, p. 117). Tree crop producers pay no provincial land taxes (Uppal 1994).

Planned tariff reductions

As an offset to the value-added tax, the basic import duty was reduced to zero from 1999. The intermediate rate was reduced to 30 per cent from 1999 to 2005 then 15 per cent from 2006, and the final goods rate to 40 per cent from 1999 to 2004 then 25 per cent from 2006 (Economic Insights 1998, p. 121).

2.2.2 Monetary policy

The approach to monetary policy in Papua New Guinea has been described as follows:

> The Board of the Bank of Papua New Guinea sets the broad framework for policy in an annual monetary policy statement that is approved by the Treasurer. There is traditionally an emphasis on monetary stability, which is

> defined as stable levels of the exchange rate, interest rates and prices, confidence in the currency and Papua New Guinea's credibility in international financial markets.
>
> (Economic Insights 1998, pp. 68–69)

Because Papua New Guinea has a relatively small open economy, considerable attention has been paid to the exchange rate. The government aims to achieve a stable real effective exchange rate that can help alleviate price volatility and reduce the economic distortions and costs imposed by exchange rate volatility. It was not particularly successful in this endeavour subsequent to floating the kina in 1994 (Kannapiran and Wosae 1995).

2.3 Planning the Development of the Tree Crops Sub-sector

The contribution by tree crop industries to economic development in Papua New Guinea depends to a considerable extent on their economic efficiency in terms of competitiveness and comparative advantage of domestic production and export marketing. Industry assistance that entails the expenditure of government funds (as opposed to costless measures such as the removal of red tape) should be considered only if:

- the industry is efficient in terms of comparative advantage and international competitiveness, or
- there are steps that the government could take to enable it to be efficient.

In a market economy, most economic reforms focus on setting the right prices, and minimising trade barriers and market distortions. They are based on the premise that trade barriers to protect inefficient traded and non-traded goods sectors ultimately diminish economic welfare. Assessment of the comparative advantage and competitive advantage in the production of traded goods should facilitate policy reform, thereby aiding decision-making in resource allocation and in implementing trade policy.

2.3.1 Development objectives

The government of Papua New Guinea sets its development objectives in the context of a market economy, and recognises the potential of agricultural development to generate sustainable income and employment opportunities through the production of traded goods. The key development objectives are

sustainable and equitable economic growth, poverty alleviation and the creation of new employment opportunities.

The government defined four guiding principles for the period 1995 to 2000 and beyond (DAL 1995a, p. iii):

- concentration on investment programs with high returns to production, exports and employment, and minimal adverse effect on the environment
- alleviation of the more serious constraints on agricultural production to improve productivity
- creation of an environment conducive to greater private sector participation
- provision of people and support services to implement government projects effectively.

The government determined that agricultural services would be reformed in order to adhere to these guiding principles (DAL 1995b, p. 1).

The chief goal of the government in the food sub-sector is to increase food security (DAL 1995a, p. 5, DAL 1995b, p. 1). This is to be achieved through the development of traditional food crops, increased production of introduced food grains, and an expansion of food processing and other value-adding activities.

In the tree crops sub-sector, the government plans to allocate more resources through the industry organisations. DAL resources are to be targeted more toward smallholders in less developed regions, and value-adding schemes are to be given priority. The aim of the government is to enable farmers to increase their incomes, reduce regional disparities in wealth and help maintain competitiveness in world markets (DAL 1995b, p. 9).

2.3.2 Strategies and policies

Macroeconomic strategy

The centrepiece of government economic strategy, recently reaffirmed by the Morauta Government, is a structural adjustment program that was reintroduced in May 1996. It is funded and supervised by the World Bank and International Monetary Fund. The initial structural adjustment program, known as the Special Interventions Program (Stein 1991, pp. 9–13), was implemented in 1990 as a response to the financial crisis of 1989 brought about by low commodity export prices and the closure of the Bougainville Mine. This new program was also in response to a financial crisis faced

by the national government. It comprises macroeconomic stabilisation, trade liberalisation and structural reform initiatives in line with the 1995 budget. The national government was to attempt to meet its agricultural development objectives in accordance with the structural adjustment program. As the 1990 reforms demonstrated, stabilisation has been the easy part of the program; bringing about structural reform remains a much more difficult proposition, particularly in the public service (Economic Insights 1996, pp. 38–41).

Agricultural development strategy

Attempts have been made in the past by the national government to define strategies for agricultural development. A draft medium-term development strategy for agriculture was produced in 1984, followed by a draft national development plan in 1986. Despite sound frameworks, neither document was published or endorsed by the government (World Bank 1988). The national government and the World Bank completed an agricultural assessment review in 1988 in which they identified constraints contributing to the slow growth in the agricultural sector. They proposed alternative strategies to hasten agricultural development.

In 1992, the national government directed policy toward 'revitalising the agricultural sector, creating employment opportunities and promoting self sufficiency' (Ministry of Finance and Planning 1992, p. 55). With the election of a new government in 1994, DAL updated its medium-term development strategy for the agricultural sector, proposing strategies for accelerated growth to the year 2000 and beyond (DAL 1994, 1995a). It expressed the government's concern over the relative decline in agriculture's contribution to GDP and impacts on rural household income, employment and nutrition. As part of its strategy to achieve its development objectives, the government prioritised the tree crop sector in its budget allocation, but did not explain the role of pricing and other policy options.

Financial problems and low world commodity prices in the 1990s have made it difficult to put agricultural development strategies into practice, and to achieve agricultural development objectives. But improvements are expected under the guidance of the current structural adjustment program, which has followed a difficult path in the volatile political climate of the past few years.

The current strategy emphasises the need to expand agricultural production and export earnings through predominantly public investment policies, such as research and extension and smallholder public investment projects, and diversification and production subsidies to specific industries. It signifies a shift in thinking away from an

interventionist pricing policy towards a more market-oriented approach aimed at achieving structural change in tree crop industries through direct supply-side intervention. Interestingly, a strategy to improve gender relations in agriculture has been almost completely neglected. For example, DAL (1994) makes no mention of gender issues, and DAL (1995a, p. 14) makes only a brief mention of a strategy to expand career opportunities for women in agricultural extension.

Agricultural policies

Pricing policy has been the main plank of the government policy framework in the tree crops sub-sector until now. In theory, price intervention is undertaken by governments to correct for the failure of the market to allocate resources efficiently, and provide information to determine the optimal level of prices and output. Commonly used instruments to influence agricultural prices are:

- price stabilisation schemes
- deficiency payment schemes
- direct or indirect export subsidies
- direct production subsidies
- financial instruments.

The three main instruments applied to date have been commodity price stabilisation schemes, deficiency payments and direct production subsidies. Price stabilisation was the major policy tool used by the national government for economic stabilisation until a decade ago. Commodity price stabilisation schemes were viewed as a complement to other measures to raise productivity in implementing a medium-term growth strategy.

DAL (1995a, p. 16) proposed an evaluation of the impact of price stabilisation policy on the agricultural sector, and the appraisal and design of policy alternatives that are more market-oriented and sustainable.

2.3.3 Plan implementation

Formulation of agricultural strategies and policies to achieve agricultural development objectives, and their implementation through programs and projects, depend critically on institutional resources made available through government agencies and private sector investment. In 1993, the Ministry of Trade and Industry put forward a strategy to promote the private sector as the 'engine of growth' (Duncan et al. 1995).

However, in practice, the policy statements and actual decisions have been frequently inconsistent with the underlying principles (Duncan et al. 1995).

A movement toward corporatisation and privatisation may remove some of the problems associated to date with public agricultural planning processes, in an age of reliance on free market operations and minimum government intervention. But it is debatable whether it is a panacea to the difficulties faced by the government in formulating and implementing tree crop policies. Indeed, economic reform could have the opposite effect if it results in fewer resources being made available for the implementation of agricultural policies (in particular, a shortage of skilled planning personnel).

2.4 The Case for Policy Assistance to Tree Crop Industries

2.4.1 Are tree crop industries uncompetitive and lacking in comparative advantage?

Empirical evidence on competitiveness and comparative advantage

Various studies by multilateral funding agencies indicate considerable scope for improving the comparative advantage and competitiveness of industries in the tree crops sub-sector in Papua New Guinea. In the recent past, both the World Bank and Asian Development Bank (ADB) have cast doubts on the existence of comparative advantage in, and competitiveness of, tree crop exports. The World Bank (1994) asserted that Papua New Guinea is a high-cost agricultural producer and its major export crops are not competitive in the international market. ADB (1993a, 1993b) maintained that a major reason for the poor performance of Papua New Guinea in generating employment opportunities since independence is a lack of international competitiveness in the non-mining sector. It asserted that the high cost of producing exports and import substitutes militates against viable investment and lowers the rate of economic growth. The conclusion drawn was that the most fundamental development challenge is to overcome this lack of competitiveness.

DAL (1995b) also declared that serious cost pressures had made Papua New Guinea relatively uncompetitive in agricultural exports, and had led to virtual stagnation in agricultural production. External funding of programs in the tree crops sub-sector has been limited over the past decade due to the controversy over unsustainable price support and concerns about a lack of competitiveness of the tree crop industries.

Explanations for lack of competitiveness

The World Bank (1992) explained lack of competitiveness in terms of structural and macroeconomic factors. The structural factors include:

1) institutional rigidities in the labour market
2) weak infrastructure to support private sector development
3) an underdeveloped educational system
4) policy-induced price distortions
5) poorly defined property rights to land
6) a regulatory rather than promotional approach to new investment
7) financial system of limited depth
8) inadequate enforcement of law and order.

Factors 2, 3, 4 and 8 are powerful in directly affecting competitiveness in the tree crops sub-sector. Factors 1, 5, 6 and 7 might not directly affect competitiveness, but they compromise general development initiatives and indirectly affect competitiveness in the sub-sector.

The World Bank (1994) felt that high levels of real wages and rigidity in the labour market, plus a high real exchange rate, were the most important macroeconomic factors making PNG uncompetitive in international markets for its major export crops. Some economists (for example, Jarrett and Anderson 1989, ADB 1993a) also blamed the exchange rate policy for the poor performance of the agricultural sector. Pragma Corporation (1991) suggested exchange rate devaluation as one of the options to improve incomes and competitiveness in the tree crops sub-sector. Since these assessments, substantial devaluation of the kina and the subsequent introduction of a floating exchange rate regime should have improved the competitiveness of the traded goods sector. The same is true for the liberalisation of wages policy.

Results of a study by Kannapiran (1999c) confirm this point as they show that Papua New Guinea currently has a comparative advantage in the production of coffee, cocoa, copra and palm oil. Sensitivity analyses show that, with recent devaluations of the kina, comparative advantage at both the farm and export levels is maintained for all commodities even when the commodity prices decline by 30 per cent. The devaluation has improved the extent of comparative advantage at all levels for all commodities.

As a counterpoint to these arguments, it could be argued that world commodity prices are declining in real terms over the long term. Hence, it would be prudent to use tree crop prices lower than 1998 prices. However, it is also true that the value of the kina is declining relative to the US dollar, in which world commodity prices tend to be denominated. Furthermore, it is likely to decline in future at least at the same rate as the decline in real world commodity prices. There is therefore a strong case for the prices used by Kannapiran (1999c) when examining competitive and comparative advantage.

Kannapiran (1999c) found that the measures of competitiveness and comparative advantage for the copra export industry are the lowest among the tree crops, and recent devaluations of the kina were just sufficient to make producers in the copra industry competitive. Yet more than 75 per cent of producers are semi-subsistence smallholders who continue to produce a variety of coconut products. Kannapiran (1999c) offered three reasons why the government should continue to support the smallholder coconut industry. First, smallholders with coconut plantations have few alternative cash-earning activities, which suggests that the shadow price of their labour may be much lower than the rate used in his study. Second, there are strong cultural links attached to coconut cultivation, with associated unpriced benefits. Third, coconut is one of the important components of food and a source of other village products for the semi-subsistence smallholder. It is difficult to calculate values of all products that are derived from coconut palms and, in the study by Kannapiran (1999c), the focus was solely on the production and sale of copra. Hence, the crop could remain financially attractive to smallholders if the true prices were calculated for inputs and all outputs.

2.4.2 Continued government support to smallholder tree crop industries

Evidence

Kannapiran (1999c) made a strong case for putting greater reliance on the results of his study than those of earlier studies. In particular, the value of the kina and prices of tree crop exports have altered substantially from the period in which earlier studies were undertaken. Also, the opportunity cost of labour used in earlier studies was probably too high for most smallholders.

However, three cautionary comments need to be made concerning the simplifying assumptions about the opportunity cost of labour and its shadow price used by Kannapiran (1999c). First, it is unlikely that the opportunity cost of labour employed

in tree crop production is the same throughout all industries and regions. Second, Kannapiran (1999c) adopted a fairly simplistic procedure to measure the full impact of devaluation on labour costs in the tree crops sub-sector. This matter needs further investigation. Third, Kannapiran (1999c) followed previous studies in his choice of the shadow price of labour. At no point does he reveal whether a rigorous analysis had been made in these past studies on the choice of this shadow price. Its validity is debatable and, because of the importance of labour as an input in tree crop production, any deviation from the true social value could have marked effects on estimated measures of comparative advantage.

Despite these concerns, there is sufficient evidence from Kannapiran's (1999c) study to conclude that all four tree crop industries are economically viable under current conditions. They deserve continued assistance from the government if that assistance improves economic welfare in the tree crops sub-sector (that is, its economic benefits exceed its economic costs).

Implications for the direction of policy reform

Given the dynamic environment in which the tree crop industries operate, however, their long-run comparative advantage is not assured. Policy measures, at both the macroeconomic and microeconomic levels, are likely to be needed to help them maintain this advantage.

Kannapiran (1999c) doubted the wisdom of interventions by the government in the form of price or budgetary support in the tree crops sub-sector without an appropriate cost recovery plan. He quoted opinions by the World Bank (1995) and ADB (1993b) that such support encourages inefficiency and prevents the industries from addressing and surmounting challenges from international competition.

Kannapiran (1999c) also alluded to frequent observations about inadequate economic infrastructure and inefficient support services as major obstacles to the development of tree crop industries (for example, ADB 1993a). The basis of these observations is that some of the advantage in production would be dissipated by less efficient services in processing and marketing provided by the non-traded sector. These observations are not borne out by results of Kannapiran's (1999c) study in that the measures of comparative advantage and competitiveness are greater at the point of export than at the farm gate in each of the four industries. However, he tendered two caveats to these results. First, they are based on average budgets for production, processing and marketing; inadequate infrastructure and costly marketing services are still likely to be major constraints to many producers. Second, he did not split marketing margins

between profit and costs, implying that processors and exporters could be capturing larger shares of the profit than producers.

Microeconomic factors other than price competitiveness have a major influence on the international competitiveness of tree crop industries, notably strategic decisions made by individual firms and the quality of their management of the product, its distribution and promotion. Nevertheless, Kannapiran (1999c) argued that price competitiveness is likely to remain the most important dimension of competitive advantage for all tree crops in the foreseeable future. This is especially so for palm oil and copra, which will continue to be quite homogeneous export products for smallholders. On the other hand, increased scope can be expected for individual firms to introduce product differentiation, market focus and other non-price strategies in the coffee and cocoa industries. But it is still likely to remain a strategic option for a minority of smallholders.

Kannapiran (1999c) made the point that the international competitiveness of tree crops depends heavily on the stability of the macroeconomic environment as well as microeconomic factors. He remarked that macroeconomic policies that affect interest rates, price stability, equilibrium exchange rates and fiscal measures provide opportunities to improve international competitiveness. Other factors such as political stability and industrial relations also affect the international competitiveness of an industry. It is therefore important that the government in Papua New Guinea pursue sound macroeconomic policies in a stable political environment. Recent economic reforms should make the economy more economically efficient and tree crop industries more competitive in international markets in the long run.

Differences between comparative advantage and competitiveness, identified by Kannapiran (1999c) in estimating a policy analysis matrix, highlight key areas for further policy direction. They reveal the need to liberalise the economy further and remove distortions caused by protectionist trade policies. Competitiveness is likely to be substantially improved by further trade reforms.

In summary, it is worth quoting Garnaut (1995, p. 19), who made a good assessment of the general economic situation following devaluation that is of particular relevance to the future development of the tree crops sub-sector:

> Nominal devaluation may lead to a long-term improvement in competitiveness but large improvements require other steps as well: removal of protection, improved efficiency and reduction of the costs of law and order, public

administration, public utilities and other infrastructure, and improvements in the quality of the work force. The currency depreciation will only be a step in the long path to development if it is supported by a returned to disciplined expenditure and monetary stability.

2.5 Overview of Policy Options in the Tree Crops Sub-sector

2.5.1 International pressure for a more market-oriented approach

International organisations are promoting, even insisting upon, more market-oriented approaches to trade policy and economic management. This is reflected by the structural adjustment program that is currently in place in Papua New Guinea in which industries producing tradeables, such as the tree crop industries, are expected to play a major role in generating economic growth. Hence, a central plank of government policy in Papua New Guinea is to revitalise and rehabilitate the tree crops sub-sector, with an emphasis on the expansion of value-adding activities (DAL 1995a, p. 9). However, assistance is required to reduce resource constraints and market imperfections for a more market-oriented approach to work.

2.5.2 Context for considering policy options

Development objectives for the tree crops sub-sector

The following specific objectives are set for evaluating policies for the development of the tree crops sub-sector:

- sustainable increases in the contribution to GDP per head and rural employment from more efficient production and marketing activities
- sustainable contribution to increased smallholder farm incomes
- greater spatial and intrahousehold equity in the participation in, and rewards from, tree-cropping activities.

Factors influencing policy choice

Policy options vary in their effectiveness in creating equitable and sustainable growth. The following factors should be considered in determining the nature of policy assistance provided by the government in Papua New Guinea:

- the outcome of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) negotiations and membership requirements of the World Trade Organisation
- the current economic policy-making environment
- government policy objectives
- economic justification of different policy options after measuring their benefits and financial and opportunity costs.

The Uruguay Round of the GATT negotiations required reductions in domestic agricultural support, volumes of subsidised exports and outlays on export subsidies. Interestingly, measures such as deficiency payments[20] and direct compensation are still acceptable forms of domestic support, and developing countries have special conditions whereby extended periods are provided for support reduction.

Alternative policies need to be assessed on how appropriate and efficient they are in meeting agricultural development objectives. In Part 2, the main policy options available to the government are outlined and assessed on the basis of current empirical evidence. It is not an exhaustive list, but canvasses the options suggested by organisations such as the World Bank and research institutes in Papua New Guinea and Australia.

The policy areas for discussion and evaluation in Part 2 [21] are:

- risk management policies at the government and industry levels, covering price stabilisation, international commodity agreements, risk markets, downstream processing and market information, and farm-level strategies to manage risk (Chapter 3)
- other product market intervention options, focusing on direct price support, improvement in product quality-price relations and promotion (Chapter 4)
- factor market policies, covering land tenure, wages and input subsidies (Chapter 5)
- rural financial policies, encompassing saving and credit policies (Chapter 6)
- agricultural research and extension, with specific attention to their role in encouraging the diversification of farming activities and sustainable agriculture (Chapter 7)
- public investment policies and programs, focusing on rural infrastructure, health, education, and law and order (Chapter 8)

- macroeconomic policies, focusing in particular on the general macroeconomic setting, exchange rate manipulation and trade liberalisation (Chapter 9)
- achieving greater gender equity in tree crop production (Chapter 10).

---

9 Currently, US$1 buys around 3 kina.

10 It should be acknowledged in policy analysis that the different options can have different impacts depending on the trend assumed for future world prices.

11 Details of coffee export volumes in tonnes of green beans were primarily sourced from the coffee reports published by the Coffee Industry Corporation. Prior to 1980, figures were extracted from NSO (1979). In most instances, data were recorded in units of 60 kg bags, which were converted into tonnes.

12 Competitive advantage reflects the ability of an industry, or individual firm within an industry, to be able to compete in the long term given market prices for inputs and outputs. A country has a comparative advantage in the production of a good or service if [complete].

13 For the period from 1965 to 1975, unit export values were calculated from the export volume and value data published annually by NSO (1979). The nominal export prices in kina were converted into US dollars in 1998 prices using the nominal exchange rate, published by BPNG (1998), and the world EUV index, calculated by IMF (1999). In the case of palm oil prices, the series commences in 1972 when reliable export prices began to be reported (Fleming 1999c).

14 Figures on export volumes of cocoa were derived from various sources, but all emanated originally from Cocoa Board records. For the period from 1976 to 1980, the figures used are those published by NSO (1979) and DPI (1986). Peter (1997) published Cocoa Board figures from 1981 to 1996. The 1997–98 figures were obtained from BPNG (1998).

15 Around 40 per cent of cocoa output has traditionally come from North Solomons Province.

16 Data for the period from 1976 to 1979 were derived from NSO (1979) while DPI (1986) was the source of data for the period from 1980 to 1993. Export data for the period from 1984 to 1998 were taken from BPNG (1998).

17 The f.o.b. export price is set monthly, 'derived from the average monthly price of Philippines' copra (CIF Europe), as published by the Federation of Oils, Seeds, and Fats Association Ltd (FOSFA)' (Simmons and Anoser 1993, p. 5). The depot price is very highly correlated to both the FOSFA and f.o.b. export prices (Simmons and Anoser 1993, pp. 8-9, 18).

18 Data for the period from 1976 to 1979 were derived from NSO (1979) while DPI (1986) was the source of data for the period from 1980 to 1983. Figures for the period from 1984 to 1995 were taken from OPIC (1996). BPNG (1998) was the source of export volume data for the years from 1996 to 1998.

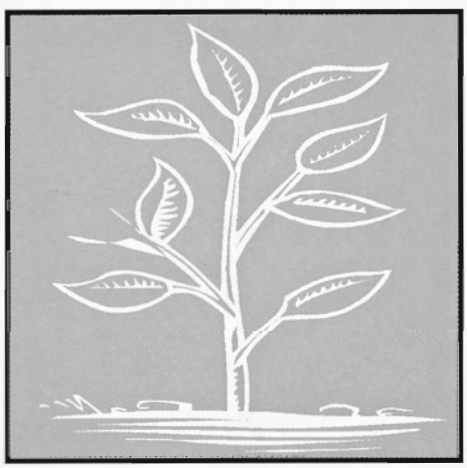
19 Levies are still in place in tree crop industries in order to fund research and extension activities.

20 Deficiency payments are price guarantees for export commodities that assist producers but do not affect consumers. The payments made to producers are the difference between the guaranteed price and the international price, where the taxpayers bear the costs determined by the slopes of the supply and demand functions. Government costs are high when supply is price-elastic and demand is price-inelastic, but low when supply and demand are both price-elastic. The success of price support is likely to be greater the higher the price elasticities of input supply and elasticities of substitution between inputs. The higher the price elasticity of supply, the lower the resource cost of achieving a given output response.

21 The initial survey of policies was undertaken by Milne and Fleming (1999). The contributions by Mary Milne to the analyses reported in Part 2 are gratefully acknowledged.

PART 2

OVERVIEW OF POLICY OPTIONS



CHAPTER 3
RISK MANAGEMENT POLICIES

3.1 Policy Options to Manage Risk in the Tree Crops Sub-sector

The government of Papua New Guinea has resorted in the past to three main measures to stabilise export earnings in the tree crops sub-sector:

- stabilisation of domestic producer prices and economic stabilisation through commodity-specific buffer fund schemes (section 3.2)
- stabilisation of world commodity prices by participation in international commodity agreements (section 3.3)
- use of price support as a compensatory arrangement to offset downward variations in producer revenue (Chapter 4).

Other potential strategies are market-based actions that do not rely on government intervention in the domestic sectors of the export markets of the tree crop industries. Knudsen and Nash (1986, pp. 27–30) reasoned that there are many such economic mechanisms in place that can be relied on to stabilise prices. They cited exchange rate changes, stockholding, price levelling in the marketing system and futures trading as examples. These and other measures can be taken at the macroeconomic, industry and farm levels.

At the macroeconomic level, manipulation of the exchange rate and conventional monetary and fiscal policy instruments provide the basic tools to stabilise the economy (see Chapter 8). Used appropriately, these measures can reduce price variability without the need to intervene directly in domestic commodity markets to stabilise prices. A graduated export tax could be applied to reduce the impact of export instability. Finally, natural portfolio effects (Larson, Varangis and Yabuki 1998, pp. 3–5) could be exploited to reduce the negative macroeconomic impacts of commodity export price volatility.

The scope to counter commodity price risk at the industry level depends on the ability of participants in the tree crop industries — from producers to export marketers — to participate in commodity risk markets. Two main alternatives exist. The first alternative is to trade in forward, futures or options markets, which can be utilised for hedging purposes. Second, the establishment of facilities for crop, yield or weather insurance is another way to overcome the adverse effects of major fluctuations in income from cash crops. The potential to use these facilities is assessed in section 3.4.

The development of downstream processing activities offers tree crop industry participants some potential to gain more influence over price-setting in the market in their industry. The scope for stabilising market conditions through these activities is discussed in section 3.5, while a more general discussion on the economics of downstream processing is provided in section 4.3.

Industry organisations have been performing a valuable role to enable producers to make more informed decisions. This role is undertaken through the collection and dissemination of market information for commodity risk management, discussed in section 3.6.

Strategic options exist for farm households to manage their price risks. They include the diversification of their economic base, resort to informal social arrangements and greater use of rural financial services to save during periods of high prices. These options are canvassed in section 3.7.

Finally, improvements in transport and communications facilities in rural areas widen the options to rural households for managing risk. This issue is raised briefly in section 8.2.3.

3.2 Commodity Price Stabilisation

3.2.1 Background

A history of commodity price stabilisation

The tree crops sub-sector in Papua New Guinea is susceptible to fluctuations in world market prices because of its relatively small size and openness, and low supply responsiveness by growers to price changes in the short run.[22] Producers are unable to influence world prices because they face close to perfectly elastic demand for their exports.[23]

The government of Papua New Guinea, and the colonial administration prior to independence, followed agricultural policies similar in vein to those in Australia from the early post-war period. It has had price stabilisation policies in place for a long time, to stabilise the macroeconomy and protect growers' incomes from excessive price fluctuations. Commodity price stabilisation schemes for tree crops were in operation in Papua New Guinea from the late 1940s until a decade ago.[24] Copra stabilisation began in 1946, coffee in 1966, cocoa in 1974 and palm oil in 1983 (Gimbol 1992, p. 189). The schemes were set up initially to provide income support to

smallholders in periods of low world prices by levying producers in times of higher prices. The government also became concerned about macroeconomic instability in the wake of the 1976 coffee boom.

Objectives

Although not explicitly stated in government policy documents, it would appear that the reasons for government price intervention are to:

- reduce price and income instability
- boost growers' incomes in years when prices are below average
- reduce the levels of risk facing producers and investors
- ensure that stabilisation funds are used to encourage macroeconomic stability.

(Wheeler and Wyatt 1978)

The objectives of price support and stabilisation policies [25] are therefore set at both microeconomic and macroeconomic levels. On welfare grounds, stabilisation policies are assumed to smooth widely fluctuating prices that lead to inefficient uses of resources, especially if producers overexpand in response to high prices and liquidate assets in periods of low and unprofitable price levels. They also aim to protect smallholder incomes from extended periods of low world prices. At the macroeconomic level, governments use price stabilisation policies to attempt to stabilise foreign exchange earnings, allowing them to plan for economic development with greater certainty and ease.

Modifications have occurred over time in the objectives of commodity price stabilisation schemes in Papua New Guinea. The rationale for the schemes has also varied among the producer, industry and national levels. Efficiency and welfare concerns for smallholders have been of prime importance in respect of producers while growth of the particular tree crop industry has been the primary aim at the industry level (Brogan and Remenyi 1987).

MacWilliam (1995) commented that one of the principal objectives of commodity stabilisation was to promote smallholder production. The ascendancy of smallholders, he claimed, 'was achieved through a state organised and supervised scheme of smallholder production', and that price stabilisation schemes 'should be seen as components of the policy supporting smallholder agriculture' (MacWilliam 1995, p. 26).

Operation

The major mechanism of price stabilisation schemes has been to decrease the variability in export revenue through the use of buffer funds. By reducing variability in export prices, it is argued, greater macroeconomic and microeconomic stability should eventuate. With the exception of the oil palm industry, industry boards have been responsible for operating the stabilisation funds and, in the case of copra, export marketing. Schemes have been operated by using buffer funds built up by imposing levies on exports at high price levels to pay bounties when prices fall below designated lower threshold prices.

Three strategies have been adopted in determining the threshold prices: survival price and cost-plus (both determined by costs of production), and a long-term moving average of the world price. The latter reflects a shift in policy objective from income to price stabilisation.

Income stabilisation was the major objective of the schemes in the mid-1970s. Hence, the threshold prices were determined by the cost-plus strategy based on a formula of the cost of production plus a margin. With world prices consistently above the threshold, this approach allowed for a large accumulation of funds, leading to expressions of concern about the high taxation of producers. In response to this concern, the system was reviewed in 1978 and the objective of the funds was altered from income stabilisation to price stabilisation. This change was implemented by introducing a moving-average price formula to reflect export price trends (Wheeler and Wyatt 1978). A 10-year moving average of world prices, adjusted for inflation, was used in schemes from 1978 to 1989 (Opa 1991). It was expected to stabilise producers' incomes, particularly those of smallholders, and lengthen the life of the funds. The formula was thought to be superior to the 'costs of production plus margin' formula because it took into consideration both demand and supply conditions over the period, and not just supply.

It was generally felt that the stabilisation schemes had been well managed using this approach, with low administration costs and satisfactory transmissions of bounty payments to growers. But it was clear by 1989 that the fund managers no longer adhered to their original objectives of the schemes being self-financing and balancing over time (SRI International 1990, p. 21). With farm-gate prices continuing above f.o.b. export prices, an unsustainable situation had been reached as a result of consistently low world prices prevailing for major commodity exports. This situation was not simply the result of low world prices but also the overoptimistic setting of intervention prices. It led to the exhaustion of funds in the stabilisation schemes for the four main

tree crop industries between mid-1988 and mid-1991. Stabilisation ceased, to be replaced by price support (see Chapter 4).

By 1997, industry organisations had repaid loans provided to support prices and had again begun to amass stabilisation funds held in deposits with commercial banks. By the end of September 1998, a total of K22.9 m had accrued. Of this balance, coffee funds accounted for K13.5 m, cocoa funds K3.9 m and palm oil funds K5.5 m (BPNG 1998, p. S23).

3.2.2 Microeconomic impact of stabilisation

Justification

The most common justification of price stabilisation is to minimise welfare losses incurred by small producers as a result of the instability of export revenue they earn. Secondary microeconomic justifications for price stabilisation include its ability to improve resource allocation within the agricultural sector and between agriculture and the other sectors, increase the saving capacity of smallholder exporters, and improve investment and maintenance decisions of tree crop producers.

Price stabilisation can be justified more readily on efficiency grounds than equity grounds. It has the potential to share resource rents efficiently and offset some of the effects from the booming mineral sector, but it is selective in its approach (Duncan et al. 1995).

The welfare argument is based on the following assumptions:

- Price stability translates into income stability.
- Tree crop producers are risk-averse.
- Export earnings make up a significant proportion of the producers' incomes by which they maintain their standards of living.
- External market forces are responsible for the variability in tree crop export earnings.
- Export price changes are fully transmitted through the marketing chain to the producers.

The first four assumptions are questioned below. The fifth assumption is largely based on the existence of a competitive market situation in the coffee and the cocoa industries (SRI International 1990, p. 26). Gumoi (1992) found the evidence

inconclusive on the extent to which bounties and subsidies are passed from the point of export to producers, whereas other analysts have found reasonably strong evidence that at least most of the bounties are passed back. SRI International (1990, p. 34) undertook some simple analyses of cocoa and coffee price transmission, and concluded that 'bounties are not absorbed by the marketing agents, but are largely transmitted to producers'. In relation to the coffee marketing chain, Overfield (1991a) found that the bounty payments to exporters did pass to coffee producers, despite the existence of three intermediaries between the grower and the point of export. In addition, Guest (1989), using export prices and local supplier prices, found a significant degree of price transmission in the marketing chain for the tree crops sub-sector. Simmons and Yarbro (1993, p. 15) found evidence that the cocoa producer price incorporated bounties paid and levies incurred at the export level.

Different situations prevail in the oils industries. SRI International (1990, p. 22) reported that the situation for copra is relatively straightforward, with the Copra Marketing Board including bounties and levies directly in the depot price. For palm oil, smallholders contribute all levies and receive all bounties paid directly on fresh fruit bunches at the factory door (Ellingson and Burnett 1998).

Achievement of microeconomic objectives

The following factors need to be considered to assess the impacts of price stabilisation on tree crop producers: [26]

- the risk reduction impact
- the effects of stabilisation on producer prices and growth in the incomes of producers
- effects on long-run planting decisions and investment
- administrative and resource costs
- income redistribution effects.

The evidence is largely favourable on the question of reducing the extent of the risk impact. Variability in coffee export prices has been significantly reduced by the stabilisation schemes (Overfield 1991a). Gumoi (1992) showed that the copra scheme has been the most effective in reducing export price variability, followed by cocoa and coffee and finally oil palm.

However, price stabilisation appears to have had only a small positive effect on growers' incomes (Jarrett and Anderson 1989, Overfield 1991a, Gumoi 1992).

In cases where the marketed surplus of a producer varies inversely with the industry-level marketed surplus, the stabilisation schemes have actually made the producer's income more unstable (Fleming and Piggott 1989).

It has been asserted that income is often spent on consumption or repayments of social obligations rather than investment during periods of high export prices although hard evidence on this form of behaviour is not forthcoming. In addition, it has been argued that the smallholder is not very familiar with the practice of borrowing for investment purposes, constrained by land tenure arrangements, and lack of access to credit and remunerative saving opportunities in rural areas (Jolly, Beck and Bodman 1990, p. 17).

In their review of price stabilisation, Jolly et al. (1990) suggested that price stabilisation schemes create only small net economic benefits, and that their justification depends on political considerations. However, the level of benefits resulting from attempts to counter the negative impacts of price fluctuations and consistently depressed world prices is not known.

SRI International (1990, p. 55) was more positive:

> In sum, stabilization has had a definite overall positive microeconomic impact. By effectively reducing the price variability faced by exporters, the schemes reduced the risks involved in producing these crops. Moreover, by investing balances in interest bearing accounts, the funds were able to pay bounties more often than levies, such that the average price was higher than the world price.

A risk reduction benefit of price stabilisation was also measured by Overfield (1991a) in the coffee industry.

SRI International (1990) and Overfield (1991a) took a rather narrow welfare view of the potential benefits and costs of price stabilisation. Other factors cast doubt on their findings and those of others who have pointed out the benefits of price stabilisation.

First, the stabilisation schemes have the potential to create sizeable distortionary effects that reduce the level of export receipts. Prices have been separated from short-run marginal costs, thereby removing the incentive to produce more in periods of high prices and less in periods of lower prices (Claessens and Duncan 1993). Hence, misallocation costs may also be significant if, in the short run, producers have responded to price signals that mask true long-term market trends. Fleming (1999e) found that temporal allocative inefficiency is encouraged by price

stabilisation that has the effect of increasing supply at low price levels to a lesser extent than it reduces supply at high price levels. Ultimately, the cost depends on the elasticities of demand and supply of the given commodities but, in the long run, the schemes may well have led to intersectoral resource distortions. With prices supported during periods of prolonged low world prices, the stabilisation schemes have most likely lessened incentives to producers to divert resources into more profitable activities, stifling the process of diversification needed to reduce a chronic overdependence on resource rents.

Second, the stabilisation schemes were established partly to act as a buffer against external disturbances in order to reduce the level of risk faced by smallholders in Papua New Guinea. This relies on strong assumptions about the degree of risk aversion of smallholders. Fallon (1992) observed that price stabilisation has been most successful in situations involving risk-averse farmers, low price elasticity of supply and low administration costs. But the assumption that farmers in the smallholder tree crops sub-sector are at least moderately risk averse has not been supported by empirical evidence; in fact, little is known about their level of risk aversion. The use of this criterion in assessing the effectiveness of stabilisation funds was challenged by Fleming (1992) who claimed that it assumes the operators of the schemes are more skilled at managing risk than the individual households are.

Third, Fleming and Piggott (1989) found no evidence from their work in South Pacific countries to support a negative impact of price instability on investment levels. Although the stabilisation schemes have been set up to encourage higher levels of investment, evidence shows that investment has been reduced through forced savings during periods of high prices (Jarrett and Anderson 1989, Fleming 1992). With uncertainty surrounding export prices, conservative estimates have often been made to keep producer prices at a lower than average level. Stabilisation schemes have thereby dampened incentives to firms to innovate and expand during periods of high export prices, affecting investment in export agriculture (Jarrett and Anderson 1989). Offsetting these negative impacts, Fleming (1999e) found that price stabilisation has the effect of increasing the overall effect on tree crop production of new plantings by encouraging more plantings in periods of low prices. Output expands in periods of high prices because the trees planted when prices are low tend to reach full production capacity when prices return to high levels, given cyclical price movements.

Fourth, the estimates of the additional returns on the investment of funds accumulated in deposits in the stabilisation schemes by SRI International (1990), for example, ignore the opportunity costs of these deposits to the smallholders. The

financial costs of price stabilisation have been high, especially given scarce financial and qualified labour resources (Overfield 1991a, Onchoke 1996). When the opportunity cost of capital was taken into account at the industry level, Fleming (1999e) showed that stabilisation could have varied effects on industry profitability, depending on assumptions made about the future prices of tree crop exports, and the nature of the stabilisation strategy. He found that the impacts on economic surplus are very small in all cases. The fact that industry organisations could obtain higher interest rates on deposits of stabilisation funds than smallholders were capable of doing by themselves reflects more on the inadequacy of saving opportunities in rural areas (section 6.1) than an inherent superiority of stabilisation schemes over individual stabilisation strategies.

Fifth, the source of variability in export revenue needs to be identified in order to treat the relevant cause of the problem. Thus far, emphasis has been on countering demand variability, yet Onchoke (1996) found that domestic supply factors are as influential as demand factors. If this is true, the effectiveness of price stabilisation in reducing the external shocks becomes less relevant to stabilising producers' incomes. There is other evidence that price stabilisation does not necessarily translate into export revenue stability (Fleming and Piggott 1989). Some world price variations are partially offset by demand and supply interaction effects (Fleming 1992) and exchange rate movements (Jarrett and Anderson 1989). It has also been demonstrated that price stabilisation schemes are not appropriate to achieve objectives such as income stabilisation and collection of tax revenues (Claessens and Coleman 1993). If the objective is to stabilise incomes rather than prices, policy makers should address income stabilisation directly.

Finally, there is some evidence that price stabilisation schemes have created inequity, favouring estates over smallholders where smallholder supply is more price-elastic than that of estates (Fleming and Piggott 1989, Jarrett and Anderson 1989). In his study of coffee price stabilisation, Mwesigye (1989) estimated that funds were transferred from smallholders to estates, although the transfers were not substantial. While evidence slightly favours the proposition that tree crops smallholders are more price-responsive in supply than estates in the short run, it is not conclusive (Fleming 1999a,b, McLaren and Fleming 1999). For instance, semi-subsistence smallholders in the copra industry are generally assumed to enter the market or increase supply when prices are high and exit the market or reduce supply when the prices fall while, in contrast, estate copra producers remain unresponsive to price changes. Yet Fleming (1999b) found that the estimated short-run price elasticity of copra supply response for smallholders was not significantly different from that for estates.

3.2.3 Macroeconomic impact of stabilisation

Objectives

The macroeconomic justification of price stabilisation is based on the assumptions that Papua New Guinea is an open economy that depends heavily on imports and foreign capital, and relies primarily on an agricultural export sector that faces volatile world prices. Volatility in the external sector thereby creates difficulties for macroeconomic management. When prices are high and foreign reserves are low, for example, there is pressure on inflation and the exchange rate, respectively.

Commodity price stabilisation schemes are supposed to help insulate the economy from external shocks that would hinder the achievement of broader development goals by varying domestic demand, government revenue and foreign exchange earnings. The national government therefore expects them to complement its macroeconomic policy framework.

Justification and effectiveness

Kannapiran (1999b) assessed the extent to which the commodity price stabilisation schemes had met their macroeconomic objectives. His modelling results suggest that the schemes had failed to stabilise the macroeconomy, and had adversely affected the external balance. The macroeconomic impacts of changes in tree crop export earnings were found to have been significant prior to the boom period for mineral and energy exports, but have been declining over the years since the boom began. Tree crop export variability continues to affect GDP, but to a diminishing extent. On the other hand, it appears to affect the balance of payments to an increasing degree. With increased diversification in the rural and mineral exploration sectors, however, the economy appears to be growing strongly enough to withstand the shock of this variability. Money demand and the levels of private consumption and investment are also affected; again, the impacts are less since the boom. The inflation rate, nominal interest rate and employment rate appear not to be significantly affected by changes in tree crop export income.

Kannapiran (1999b) concluded that, overall, commodity stabilisation schemes now have a diminished role in stabilising the macroeconomy than they had in the past. Agricultural exports have declined in importance with rapid growth in the minerals sector, reducing their impact on GDP. Even by the 1980s, end-of-year deposits made up only about 20 per cent of the broad money supply, suggesting there has been no significant impact on the money supply from the agricultural stabilisation funds (Jarrett and Anderson 1989).

On a broader canvas, Cashin, Liang and McDermott (1999) used monthly data on 44 primary products from IMF (1999) to assess how long it takes for external price shocks to dissipate. They declared that policy makers:

> ... need reliable estimates of the magnitude and duration of commodity price shocks when considering countercyclical stabilization policies. Although policy initiatives that smooth national income and consumption may be effective in the face of short-lived price shocks, long-lived shocks call for policies that enable countries to adjust to new income and consumption levels.
>
> (Cashin et al. 1999, p. 42)

The length of time of the lag was found by Cashin et al. (1999) to be considerable for all four of the tree crop exports of interest in this study. Average duration was shortest for palm oil (64 months) and coconut oil (70 months). It was substantially longer for 'other milds' coffee (150 months) and permanent for cocoa. It is more than mere coincidence, Cashin et al. (1999, p. 43) concluded, that failed stabilisation schemes have involved commodities typically subject to long-lived shocks. This is because such price shocks depress prices for a long time, making commodity price stabilisation schemes ineffective and rendering unsustainable external borrowing to smooth consumption.

3.2.4 Operational efficiency of the stabilisation schemes

Commodity stabilisation schemes must be self-financing, balanced, predictable and well managed for efficient operation. According to Gilbert (1993), the following criteria should be considered to achieve such aims:

- ability to predict long-run price trends
- insulation of the scheme from the general government budget, ensuring deficits and surpluses of the scheme are not recorded in the accounts or used as a taxing vehicle
- sterilisation of scheme funds from the national economy
- pursuit of compatible goals.

The price stabilisation schemes in Papua New Guinea have been less than successful on the criteria of fund sterilisation, self-financing and predictability. Stabilisation funds have been only partly sterilised (Kannapiran 1999a). Prolonged low world prices and inadequate strategies to determine threshold prices and fund balances have hampered the continuity of funds. Predictability has been problematic because future rates of

levies and bounties are not known with certainty. Managers of stabilisation funds face difficulties in forecasting world price changes and their sources (Fleming and Piggott 1989). The government has compounded these difficulties by overriding the bounty and levy formulas at its own discretion, undermining public confidence in the schemes. The temptation to reduce the collection of levies and keep threshold prices unduly high is ever-present (Opa 1991).

Government action to override a formula can be justified if it can be shown that the formula is unsuitable for determining the appropriate threshold price. Use of a 10-year moving average of world prices, adjusted for inflation, might not be appropriate when trends in real prices and irregular cycles exist. Over the past two decades, periods of low and volatile world prices have found the formula wanting, alternately leaving funds too high or exhausted. Opa (1991) suggested that costs of production and world prices should both have been considered in determining the threshold level. Arguably, the use of the consumer price index for Port Moresby has also made the threshold price too far removed from the long-term price trend (Overfield 1991a).

In creating a self-financing stabilisation scheme, the optimal size of the fund needs to be established; yet no mechanism in the formulae used in Papua New Guinea has yet been established to determine it. This too can lead to situations where prolonged low world prices exhaust funds, as occurred in 1989 and 1990, or peaks of high prices leave fund balances too high. Problems have also arisen because of restrictions on the amount of funds paid out annually, allowing them to be diverted to other purposes. It has been suggested that only 50 per cent to 75 per cent of the funds should be loaned out annually, but this has been criticised for potentially weakening the ability to stabilise producer prices (Claessens and Coleman 1993, Overfield 1991a).

The timing of bounties and levies has been subject to error because the calculation of bounties draws comparisons with average prices in the previous year while levies use current prices. Hence, time lags and the use of different formulae for levies and bounties have led to situations of levies and bounties being paid simultaneously (Jolly et al. 1990).

Available evidence suggests that the prospects are slim for making commodity price stabilisation funds self-financing in Papua New Guinea in the long term. Modifications have been suggested, such as restructuring the organisation of the funds, and improving the formula to reflect the appropriate threshold prices and determine the optimal size of the funds. For example, Overfield (1991a) proposed a five-year moving average with no adjustment for inflation as an alternative determinant of the threshold price.

However, the long-term decline in real terms of world prices of tree crops [27] has made the operation of the funds difficult. The situation where f.o.b. export prices remained below the threshold price for a prolonged period in the late 1980s and early 1990s is indicative of the likely future risk of exhaustion of stabilisation funds.

Given that Papua New Guinea stabilisation policies initially followed the agricultural policy direction in Australia, it is interesting to observe recent trends in the latter country. Commodity price stabilisation schemes have been dismantled and the government has largely withdrawn from efforts to stabilise agricultural earnings.

3.3 International Commodity Agreements

In the past, coffee and cocoa producers in Papua New Guinea have been party to international commodity agreements in a global attempt to control the volume of exports of these commodities in the world market. The main aim of this control was to ensure an orderly and stable international marketing system. International commodity agreements were popular in the 1970s but, while some are still nominally in force, they no longer have any economic effects on the relevant international commodity markets.

The International Coffee Organization, which is responsible for the negotiation and establishment of the international coffee agreements, comprises virtually all coffee-exporting countries and most coffee-importing countries. The first International Coffee Agreement was put in place in 1962, and was followed by further Agreements in 1968, 1976 and 1983.[28] The 1983 Agreement contains provisions relating to the introduction, operation and suspension of quotas, stocks of members, coordination of production policies, promotion, information gathering and dissemination, economic research, and distribution and consumption. It was extended without any economic provisions due to a failure by members to agree on quotas (which existed for only part of its duration) and other operational matters.

Papua New Guinea first became a member of the International Cocoa Organization in 1973. The International Cocoa Organization is responsible for operating the International Cocoa Agreements, the most recent of which came into being in January 1987. Yarbro (1988, p. 7) observed that the Agreements had only limited effects on international cocoa prices, and questions had been raised in Papua New Guinea about the worth of membership.

Negotiations on new international commodity agreements collapsed due to breakdowns in cooperation between members as well as the exhaustion of funds, and existing agreements are no longer relevant to attempts to stabilise the world prices of coffee and cocoa. The prospects for the implementation of further agreements with economic provisions are not bright in the current economic climate. Even if new agreements were to be negotiated and implemented, they would be unlikely to yield any long-term benefits to tree crop producers in Papua New Guinea. In the words of Jolly et al. (1990, p. 66), the 'longevity of the International Coffee Agreements attests to the skill of the negotiators rather than to any overall economic benefit'.

3.4 Participation in Risk Markets

Larson et al. (1998, pp. 13–18) gave a good account of the rise of commodity risk markets, their potential and limitations, and implications for developing countries. The measures mentioned in this section are viewed as best carried out within the tree crop industries themselves. However, this does not preclude government initiatives in these endeavours or actions by the government to facilitate their implementation.

3.4.1 Forward, futures and options markets

Evidence in Papua New Guinea

The major industry measure to counter commodity price risk in the tree crops sub-sector is the exploitation of hedging facilities in forward, futures and options markets. Recent innovations in financial instruments and techniques have improved the chances of such exploitation in Papua New Guinea.

It has been considered economically undesirable for small farmers to manage their own commodity risk. This would appear especially true of the tree crops sub-sector, which comprises mainly smallholders who face credit constraints and lack access to a complete set of contingency markets. However, new financial instruments and techniques have emerged to manage commodity risk. Use of foreign currency-denominated bonds, interest and commodity futures and options markets are potentially applicable to Papua New Guinea (Claessens and Duncan 1993).[29] Financial instruments enable producers or marketing boards to use the market, in conjunction with marketers and financial dealers, to offset their exposure to price risk in the short run.

Evidence elsewhere in developing agriculture

With only sparse evidence of the effective use of financial instruments to manage risk in agriculture in Papua New Guinea, reliance is placed on evidence elsewhere in developing agriculture. Claessens and Duncan (1993) outlined five major benefits of financial instruments:

- They are considered more efficient than traditional price intervention by the government because they do not involve the transfer of resources that could be used more productively in another sector.
- They can provide stabilisation of prices over a longer time horizon, creating a more desirable investment environment.
- The financial instruments yield information on world market expectations of future prices, thereby reducing the need for (frequently inaccurate) long-term price forecasting.
- The free-market solution is less likely to create distortions in investment and production decisions, as has previously been the case under more interventionist approaches such as the tree crop price stabilisation schemes.
- Financial instruments are meant to diversify risk, which is a condition for successful price stabilisation.

Financial instruments can be implemented either separately or in conjunction with existing stabilisation policies. Claessens and Coleman (1993) put forward a case in Papua New Guinea for the integration of financial instruments into the existing price stabilisation schemes. They suggested that commodity futures could be used to hedge the intra-year price risks faced by managers of the schemes.

A primary role for the private sector

The private sector would be more effective in managing risk, given that the appropriate institutions are in place and government intervention is minimal (Claessens and Duncan 1993). Larson et al. (1998, p. 21) referred to situations in which a government or industry organisation has put in place 'an aggregating institution' to undertake commodity risk management strategies on behalf of growers. Another example in the same vein, mentioned by Larson et al. (1998, p. 21), 'involved the provision of a two-year loan to coffee producers [in Guatemala] structured as prepayment financing through Cargill [a multinational agribusiness firm]'. A coffee price risk management scheme was included in the scheme 'in the form of a zero-cost collar (where producers are guaranteed a minimum price and paid for this price insurance by agreeing to a maximum sale price for their coffee)'.

Hughes-Hallett and Ramanujam (1990) proposed a support scheme that can replicate the hedging or options strategies usually undertaken in the contingency markets. It is designed to 'buy' certainty or predictability, instead of modifying the systematic part of earnings.

Emergence of an international task force

The International Task Force on Commodity Risk Management in Developing Countries is currently establishing a process to develop new approaches to manage vulnerability to fluctuations in commodity prices. So-called 'commodity-dependent small states' such as Papua New Guinea are a major target of this initiative. The key to the success of the Task Force lies in its ability to incorporate smallholders in the benefits of risk management activities through the so-called 'local transmission mechanisms'. Such ability is far from certain, but private exporters in Papua New Guinea have practised price levelling in the past (Fleming 1999b, McLaren and Fleming 1999, Ruhle and Fleming 1999). It is reasonable to expect that some of the outcomes of participation in risk markets that reduce export price variability for export marketers would be transmitted to producers through further price levelling.

3.4.2 Crop insurance

The establishment of facilities for crop, yield or weather insurance is another potential way to overcome the adverse effects of major fluctuations in income from cash crops. Larson et al. (1998, p. 12) observed that 'there are limits to the ability of very poor households to self-insure and governments often choose to intervene in markets to offer some minimal protection to producers and consumers'. Hazell (1992, p. 579) outlined the potential benefits and costs of crop insurance programs, and concluded his survey of agricultural insurance by stating that it has only a limited role to play in the efficient management of farm risk. Other schemes might prove more cost-effective than both private and public crop insurance programs. While conceding this point, Larson et al. (1998, p. 12) felt that such programs still have the potential to address catastrophic crop losses. While catastrophic crops losses can occur in Papua New Guinea, the problem in tree crop industries is that most risk emphasis has been on price risk rather than yield risk.[30] The markets for these two types of risk have tended to develop separately, for good reasons (Larson et al. 1998, p. 12).

3.5 Downstream Processing

A more general discussion on the case for government intervention to encourage downstream processing is provided in section 4.3. The narrower issue considered

here is the use of downstream processing as a means to stabilise export earnings. The key argument in favour of downstream processing as a device to stabilise tree crop prices is that it offers potential for greater control over export price movements. This is achieved by enabling market participants in tree crop industries to incorporate value-adding activities that are less susceptible to price variability, and to exert greater control over price-setting mechanisms.

Ignoring for the moment the issue of whether it is economically justified, downstream processing has two possible shortcomings as a stabilising device. First, control over more downstream activities does not automatically reduce export price variability. It depends on the study period chosen, stage in the marketing process and length of the observations chosen. A comparison of monthly Brazilian arabica green bean prices and US wholesale instant coffee prices for a study period containing both high and low prices in the world coffee market (1982 to 1992), for example, supports the contention of a major reduction in price variability further along the marketing chain.[31]

On the other hand, a comparison of annual arabica green bean and instant coffee prices at the point of export in Brazil after the boom period in the world coffee market (1986 to 1996) reveals variability in the instant coffee price series to be greater than that for the green bean export price series.[32] The latter is arguably a more relevant comparison for Papua New Guinea. It appears that price levelling does substantially reduce price volatility the further the product progresses along the marketing chain within the importing country. But it is doubtful whether exporters from Papua New Guinea could establish footholds in processing and distribution within importing countries. A boom period on the world market does increase the variability of green bean prices relative to more processed coffee products, yet large upward movements in price tend not to be viewed detrimentally by exporters. Finally, intra-year variations tend to be greater for green beans than for soluble coffee. But hedging by exporters on the futures market (section 3.4.1) can help reduce any adverse effects of large intra-year price variations.

Second, greater non-price competition often exists in the export market for a more processed product. This form of competition can be quite severe given the weak bargaining positions in consuming countries of small exporters relative to the multinational corporations that dominate downstream processing of products such as coffee and cocoa. It introduces a new element of uncertainty in export marketing activities.

3.6 Market Information

3.6.1 Benefits of market information to smallholders

Use of market information by smallholders

Smallholders in the tree crops sub-sector are keenly interested in, and use, market information when making their production and supply decisions (Kuimbakul and Gilling 1989). Bourke (1993, p. 27) observed that villagers 'are generally enthusiastic about receiving new information'. Transparency in prices can therefore influence resource allocation decisions.

Agricultural education and improvements in market information can have a positive interaction effect on tree crops development (see section 8.4), reducing the need for government intervention in tree crop markets. To achieve the full beneficial effect, persistent time lags in the transmission of price information to the level of primary supply (the farm) need to be eradicated, and management information systems must be improved.

Role of market information in risk management

Larson et al. (1998, p. 26) viewed the provision and dissemination of market information as a vital component of commodity risk management, and highlighted the 'scope for increasing awareness in using existing information systems'. They recommended the development of appropriate price indices as references for hedging instruments, and acknowledged the important roles of market transparency and dissemination of price signals in managing market risks.

3.6.2 Dissemination of market information

Industry responsibility

Industry organisations are responsible for the provision and dissemination of market information, especially to producers. Initially, DAL had the responsibility of providing general market information, but this changed with the reassignment of responsibilities in the tree crops sub-sector as DAL became incapable of satisfying all the needs of the tree crop industries (see section 7.2.2).

In recent times, CIC has led the way in providing regular market information, exemplified by their annual publication of coffee reports (for example, Stapleton et al. 1999) and the recent publication of exporter marketing costs (Stapleton 1998). For a few years, the Cocoa Board also provided valuable reports containing market information (for example, Peter 1997).

Deficiencies in information systems

Despite these publications containing market information, Fleming (1999f) contended that institutional memory is not a strong point in the tree crops sub-sector. Much of the considerable body of knowledge and information accumulated from past work in economic analysis is difficult to access. Bourke (1993, p. 35) noted that a wealth of information available on certain topics and crops has never been assembled and assessed, and much of it has not been used. There has been a failure by many agriculturalists to build on the readily available published information.

This suggests there is a need to establish a simple management information system to aid the retention of institutional memory. Fleming (1999f) gave an example of the publication of producer prices as a key economic variable that would help in risk management. Industry organisations have been active in recording delivered-in-store prices or price series at the depot or factory door. But these prices tend to be the closest one can get to farm-gate or producer price series after allowances are made for any bounties or levies. Information on the relationships between factory-door or depot prices and farm-gate prices is sketchy, and reliable estimates need more formal and regular data-gathering processes.

Any management information system needs to be an integrated one, yet DAL (1994, p. 42) observed that it had five information systems in place at one stage. All were only partly in operation and yielded few benefits to users of agricultural information. Bourke (1993, p. 34) declared the information base to be inadequate for planning and research in Papua New Guinea.

Small developing countries such as Papua New Guinea find it chronically difficult to fund the sorts of agricultural research programs that would provide sufficient knowledge in each industry. At the same time, it is not obvious that full advantage is being taken of knowledge gained from research work carried out, and data collected, in other countries producing similar tree crops.

Industry organisations and DAL have struggled to maintain their intellectual capacity in economic analysis on a consistent basis. The major problem has been staff shortages at various times. DAL had a strong complement of people in economic policy making until the early 1990s. Since then, however, its analytical capacity has fallen away dramatically.

Ways to improve information systems

Eyzaguirre (1996, p. 43) suggested a parsimonious approach to improve knowledge by processing information from similar production and marketing environments in other countries through external linkages:

> Scanning, selecting relevant external sources, and directing useful information to producers and policymakers is a major way for research systems to perform their tasks, without necessarily generating new technologies or conducting extensive experimentation.

Such an approach might be worth pursuing as part of a management information system in Papua New Guinea.

Staffing is the chief means of improving the flow of market information. Economists in the industry organisations have varied in number, with a heavy reliance at times on expatriates. CIC is now emerging as one organisation with a strong team capable of economic analysis, and it is to be hoped that this situation remains into the future. Of course, it is not sufficient to have the numbers of skilled analysts; they need to have the financial resources that enable them to carry out the often expensive and time-consuming tasks of data collection and analysis.

Greater discernment is desirable in deciding which institutions in Papua New Guinea should be given responsibility for collecting different sorts of information pertaining to tree crops. At present, inter-institutional decisions about data collection appear to be ad hoc. With few exceptions, data collection processes are disjointed and lack continuity.

Industry organisations have closest contact with the activities of the tree crops sub-sector, and have valuable contributions to make to the collection, storage and use of data. Their contributions would be enhanced if they were able to play a greater role in policy formulation and implementation through the Commodity Working Group. At present, they appear to be formally treated as outsiders in the policy-making process.

Above all, the government of Papua New Guinea and international development agencies can play a role by ensuring that secure funding is available to allow for the long-term accumulation of information through domestic data-collection processes. It can be quite useful to have major projects collecting microeconomic information on tree crops for a specified period, as occurred in the 1980s with the Papua New Guinea Export Tree Crop Study (for example, QDPI–DAL–CIB 1987, Yarbro and

Noble 1989). But such an exercise loses much of its value unless it sets in place continuous data-collection activities by national institutions that involve field workers in the tree crops sub-sector.

3.7 Farm-level Strategies

3.7.1 Risk-minimising strategies of smallholders

The notion that governments need to involve themselves in the management of risks that smallholders face from market price fluctuations has been challenged in a number of quarters. Fleming (1992) pointed out that no evidence exists to confirm the superiority of the state over smallholders in managing farm risks in Papua New Guinea.

Fleming and Piggott (1989) made the point that subsistence farming, domestic food markets and off-farm employment provide the bulk of the (cash plus subsistence) income and living requirements of smallholder families in Papua New Guinea. For example, Overfield (1994) estimated for a sample of coffee smallholders in Eastern Highlands Province that about 50 per cent of their income came from food and livestock.[33] Smallholders also tend to rely very little on cash inputs in producing tree crops (for example, Overfield 1995). Together, these two factors limit their reliance on commodity export earnings, and so minimise their exposure to major cash losses from downward fluctuations in output prices.

Overfield (1991b) identified the prevalent smallholder strategy in coffee production in Papua New Guinea as the maintenance of a degree of flexibility, and resilience in times of economic hardship, by diversifying sources of income. He observed that:

> As coffee prices have fallen in both nominal and real terms in recent years, there does appear to have been some movement back into subsistence production; 13 per cent of smallholders indicated that they were now growing more of their own food as a direct result of coffee price falls.
>
> (Overfield 1991b, p. 11)

In sum, flexibility and diversity in production and income sources enable smallholders to be proficient at implementing their own risk-minimising strategies (Fleming 1992, Overfield 1997). If world prices of tree crops fall, they have the ability to move into subsistence farming and other forms of production for the market.

3.7.2 Other household strategies

Informal social arrangements

Informal social arrangements are another tool that individual households can use to manage risk. Family, friends and fellow villagers help out financially in times of need, a common enough occurrence in the rural areas of Papua New Guinea. A problem with commodity price risk in tree crops-based farming systems, though, is that it suffers from high covariance risk. These potential supporters are likely to be in a financial situation similar to the household in need when assistance is most required. It is overcome to a limited extent through exchange arrangements between people in different areas (Paul Barker, Prime Minister's Department, personal communication, 1999).

Rural-urban migration

Rural-urban migration is a popular measure employed by rural households to even out cash inflows over time. Here, some (usually younger) family members obtain employment, usually in towns or cities, in which they receive a regular remuneration unconnected to the fluctuations in prices of key agricultural products. Their remittances can be relied upon during periods of low commodity prices.

Saving strategies

Households can use saving and dissaving to smooth consumption over time in response to fluctuating cash incomes brought about by variability in commodity export prices. Loayza, Schmidt-Hebbel and Servén (1998, p. 23) reported evidence of this sort of behaviour in developing countries in general. But the incentives to save in Papua New Guinea are not strong. Evidence from data reported by Economic Insights (1998, p. 167) suggests that real interest rates on term deposits in the 1990s have been negative (Fleming 1999d). Montiel (1994) found that Papua New Guinea was the only country among more than 50 developing countries with a high negative saving–investment correlation, presumably because a high proportion of domestic savings is invested overseas.

---

22 For the four main tree crops, price elasticities of supply have been estimated, and past estimates summarised, by Fleming (1999b, c), McLaren and Fleming (1999) and Ruhle and Fleming (1999).

23 Gibson (1994) estimated very high price elasticities of export demand of at least –12 for coffee and –11 for cocoa. Similar high elasticities can be expected for copra and palm oil (Fleming and Piggott 1989).

24 See Jolly et al. (1990) and SRI International (1990) for detailed descriptions of these schemes.

25 Price stabilisation refers to the reduction in the variability of a commodity price paid to producers to within a specified range on a self-funding basis. Income stabilisation refers to the reduction in the variability of income earned by a producer from the sale of a commodity to within a specified range. Price support refers to the maintenance of a commodity price paid to a producer at or above a specified minimum level.

26 Impacts on smallholders and estates differ according to their consumption and investment behaviour. It is usually assumed that estate exporters have adequate financial resources to counter export instability effects (for example, Fleming and Piggott 1989). Hence, the welfare effects of price stabilisation are principally in reference to smallholders in the discussion that follows. This is not to say that price stabilisation does not confer benefits on estates. As Brogan and Remenyi (1987) observed, estates have found a stable price environment conducive to the task of decision making and investment appraisal.

27 See, for example, the world real price trend for 'other milds' coffee estimated by Fleming and Antony 1993, p. 164).

28 See Fleming and Antony (1993, Appendix 1) for a description of the International Coffee Agreements.

29 Forward contracts reduce the variability in prices of commodity exports through the agreement in advance by the buyer and seller of price, quantity and time of sale. However, adherence to the arrangement is commonly hindered by inadequately developed financial markets and lack of quality control. Futures markets trade in liquidity, removing the problem of actual physical transfer of the commodity. They enable traders to decrease the risk associated with price variability by hedging.

30 This is because, as a general rule, perennial crops tend to suffer much less from yield risk than annual crops in smallholder farming systems (Ruthenberg 1980, pp. 260–261).

31 Monthly data were used to estimate coefficients of variation during the period from January 1982 to December 1992 for the US wholesale soluble coffee per 16-ounce container and the International Coffee Organization indicator price for Brazilian arabica green beans on the New York market. The coefficients of variation were estimated to be 0.05 for the soluble coffee and 0.17 for the green beans. The data source of both series was USDA (1993, pp. 19–20).

32 Annual data for the period from 1988 to 1996 on the export unit values of soluble coffee exports from Brazil (derived from data published by the Brazilian Instant Coffee Association) have a coefficient of variation of 0.38. The coefficients of variation for both Brazilian arabica and 'other milds' arabica indicator prices for the same period are 0.31. The indicator prices were derived from data published by the International Coffee Organization.

33 This is despite largely futile policies adopted by the government of Papua New Guinea in the early stages of development of the smallholder coffee industry to discourage intercropping with coffee trees (Bourke 1985).

CHAPTER 4
RAISING PRODUCT MARKET PRICES

Four options for product market intervention to raise tree crop prices are canvassed in this chapter. The first of these options, direct price support, is covered in section 4.1. It relies heavily on government intervention in the product markets. Some background information is given on the rationale and past provision of price support in the tree crops sub-sector in Papua New Guinea, followed by an assessment of its effectiveness. The other three options are more market-based policy initiatives but are likely to rely on at least some commitment by industry organisations and the national government. They are improvement in product quality-price relations, value-adding through processing and product promotion, and are dealt with in sections 4.2, 4.3 and 4.4, respectively.

4.1 Product Price Support

4.1.1 Background

Export subsidies are the most common form of price support through direct government intervention in product markets. Direct payments by the government to exporters, based on the volume of exports, enable the exporter to purchase the produce at a higher price domestically and sell it on the international market at a lower price. Export subsidies take several forms: fixed, ad valorem, variable and open-ended.

When a subsidy is applied as a per unit amount, the domestic market price is greater than the international price by the subsidy. This is due to the eagerness of exporters to increase export sales in order to earn subsidy payments. Consequently, domestic prices of exports are pushed up and competition in the domestic market increases. The level of export production is expanded in the short run, but the government must beware of foreign sellers seeking the higher price.

In theory, an export subsidy increases producers' surplus where they are price takers, as is essentially the case in the tree crop industries in Papua New Guinea. Inputs are transferred to the sector to allow for output expansion, assuming the subsidies are transmitted through the marketing chain to the producer.[34] But the subsidy causes an efficiency loss if resources used in production are already fully employed.

Unlike traditional trade protection instruments, consumer surplus is not reduced by price support because deficiency payments are paid by the taxpayers and not the consumers. Nor are there transfers of surplus to overseas consumers of tree crop

commodities given close to perfectly elastic export demand functions. Because payments are made directly at the export level, no trade policy mechanisms such as tariffs or quotas are required, and therefore no restrictions are put on trade.

Nevertheless, the export subsidy option does not have the support of the international markets. This is because of a stipulation by the World Trade Organisation for governments to reduce the size of their export subsidies.

Price support need not be viewed as a mutually exclusive policy option to increase and stabilise the incomes of tree crop smallholders. For example, Fallon and Karabalis (1992) suggested it would be more effective if it were integrated with a policy to increase agricultural productivity.

4.1.2 Operation of price support in Papua New Guinea

Introduction of the AGPS scheme

Export price support on a per unit basis has been implemented in recent times in Papua New Guinea under the AGPS scheme. As mentioned in Chapter 3, an era of export price support backed by loans from the PNG Banking Corporation and Stabex loans from the European Union[35] was ushered in between 1989 and 1991 following the collapse of all commodity price stabilisation schemes (World Bank 1992, p. 19, Economic Insights 1994, pp. 97–99). The cocoa industry was first to draw upon loan funds in 1989, followed by the copra and oil palm industries in 1990 and the coffee industry in 1991 (DAL 1994, p. 15).

The government established the Commodity Working Group following the exhaustion of stabilisation funds, and it initially recommended phasing out price support over three to five years (Opa 1991). These informal arrangements were formalised in November 1992 with the establishment of the AGPS scheme. This was a deficiency payments scheme introduced in the 1993 budget that remained in force until 31 October 1997. It was operated by the Bank of Papua New Guinea, and funds were borrowed from commercial banks (Gumoi 1994).

The Commodity Working Group recommended that threshold prices be set according to the costs of production, reflecting a change from price stabilisation back to income stabilisation (Opa 1991). It was intended, first, to protect domestic producers from downward fluctuations in the international market in order to stabilise prices and their incomes. Second, its aim was to maintain income stabilisation at the macroeconomic level with the aid of the Stabex transfers. Third, an adjustment

scheme was also proposed for producers to adapt to lower international prices. Finally, DAL (1995b) expected this policy to improve the efficiency and productivity of the agricultural sector, although it did not elaborate on why such an outcome should eventuate.

Under the AGPS scheme, the industry boards and corporations operated separate funds for each of the four major tree crop industries. Initially, with the exception of oil palm, they were responsible for making 'best-guess' production and price estimates before funds were released (Gumoi 1994). Support prices were based on the perceived costs of production of an 'efficient producer' (Economic Insights 1994, p. 97).

A mechanism was then put in place to reduce the threshold price over the life of the AGPS scheme. Given that the support price was calculated as the difference between the threshold price and the delivered-in-store price, the average difference between the two prices was to be lowered at an increasing rate. In 1991, the difference would be reduced by 35 per cent in each six-month period and by 50 per cent each in each six months of 1992. However, the government deferred a further reduction in February 1991 until a review of the costs of production in the tree crop industries had been completed (Opa 1991). Instead, it raised the support prices in November 1992 and fixed them for a five-year period.[36] Following an adjustment phase, government price support was expected to fall to zero at the end of the five-year period by which time the threshold prices should have converged with the world prices.[37]

Scheme operation and cost

By 1993, price support was thought to have increased the output of export crops significantly. The AGPS scheme was revised in the 1994 budget in the light of information that government-guaranteed loan drawdowns had cost the public purse more than expected (DAL 1995b). Problems identified included pressure on finances, creation of vested interests, rent-seeking activities and an over-reliance on the government (Economic Insights 1994).

The Cabinet announced reductions in trigger prices for price support in 1995, decreasing the buffer zone between the government support price and the trigger price. Any policy changes were to come into effect in 1997, after the five-year period of price support. The national government eventually decided against reintroducing commodity price stabilisation schemes, a move supported by the World Bank.[38]

It is clear that the government had gambled on a world commodity price recovery in its price support, and the advice they received pointed in that direction (for

example, Fleming and Antony 1993, p. 295). This gamble paid off as the commodity markets did stage a rally in 1994, particularly evident in the coffee industry. Coffee and copra prices rose above their trigger prices by mid-1994 and late 1994, respectively. By 1995, modest levies were being collected from coffee producers, partially offsetting the industry's enormous debt to the government.

By 1997, however, it seemed that the initial optimism that prices would soon rise above the levy threshold to replenish stabilisation funds (Grey 1993) was misplaced. The gloomy medium- to long-term prospects for the world prices of tree crops in the mid-1990s, it appeared, would make it difficult for the industries to repay all of their loans. However, world price increases and devaluation of the kina enabled the largest debtor, the coffee industry,[39] to discharge its liabilities in full by February 1999, albeit with the help of the conversion of the status of K52.4 m of Stabex funds from a loan to a grant (Stapleton et al. 1999, p. 2). Indeed, devaluation of the kina hastened the process of domestic market recovery and, eventually, trigger prices were exceeded in all four industries. Increases in world cocoa prices moved export prices for that crop in Papua New Guinea to just under the threshold price for levies by July 1996. Cocoa prices continued to increase and, in real terms, rose by 48 per cent between 1994 and 1998, allowing full repayment by the industry of its loan. The government approved an increase of 25 per cent in the trigger price in March 1998 to reduce the burden of drought on producers.

Loan or grant?

It was never made fully clear whether the funds made available to the industry organisations by the government to support prices were a grant or would need to be repaid as interest-free loans when world prices recovered. Originally, it was apparent that the funds were meant to be repaid to the government once the international price exceeded the trigger price (Claessens and Coleman 1993), which was initially set at 125 per cent of the support price (Carruthers 1994). In this respect, the support could be construed as the government providing or guaranteeing loans to the stabilisation funds as a temporary measure. In the final event, the loan balance was K261.5 mn of which Stabex support covered 71.9 mn, or 27 per cent of the total funds provided for price support (BPNG 1998, EU Commission 1996). These funds were converted to grants, thereby substantially reducing the liabilities of the industry organisations. Hence, the AGPS scheme turned out to be in part a loan within the context of the price stabilisation schemes and part price subsidy.

4.1.3 Effectiveness

Evidence of welfare effects of perpetual price support

Little research has been carried out to date on the welfare effects of the current price support schemes in Papua New Guinea. But developing country experience shows that 'there is no evidence that any developing country has been able to achieve sustained and widely based progress based on significant price subsidies to agriculture' (Economic Insights 1998, p. 83).

Fleming (1999e) estimated the welfare effects of perpetual government support of tree crop prices for the four tree main crop industries. He found that changes in either the level of price support or the pattern of export price variations could lead to welfare losses. Results were equivocal for price variations over both the short cycles (5–10 years) and long cycles (10–15 years) chosen for analysis. Some moderate gains eventuated but also some significant losses, and results varied between production modes and according to different product price trends. They indicate welfare gains in most (but not all) industries when producers respond positively to price support in planting new areas. If planting decisions are not influenced by price support,[40] welfare losses predominate in the coffee and cocoa industries.

Fleming (1999e) acknowledged that price support could have some positive welfare impacts, a factor foremost in the minds of policy makers in past decisions to provide price support (Economic Insights 1996). First, he argued that rural employment impacts are likely to be positive, both within the tree crop industries and in related rural activities. In particular, jobs should be maintained in product marketing, processing, input supply and the distribution of consumer goods through the positive consumption multiplier effects. Many of these jobs would be in rural centres. Apart from the economic benefits of additional employment opportunities, there could be social gains through reductions in criminal activities and pressures for rural-urban migration. The opportunity costs of public provision of price support have to be weighed against these gains in that the money could have been used to create an economic environment encouraging more employment elsewhere in the economy.

Second, Fleming (1999e) cited recent empirical evidence that there is a high level of poverty among tree crop producers (Gibson and Rozelle 1998). There is the possibility that price support as a means of income transfer could have a positive equity impact. A counterpoint to this argument, however, is that the greatest beneficiaries of the price support are the largest producers, who tend not to be among the more poverty-stricken members of either society or their industry. In this respect,

price support is an inefficient measure to alleviate poverty (CIAT 1999). Duncan et al. (1995, p. 38) argued that price support is hard to justify on equity grounds.

The welfare gains to tree crop producers from perpetual price support need to be set against declines in welfare arising from any adverse impacts of price support. These impacts include budget deficit-led inflation increases (Kannapiran 1999b), crowding-out effects, misallocation of resources between tree crop industries and other agricultural pursuits, the potential for corruption and misuse of funds, and shifts in purchasing power from other sectors. Fleming (1999e) stressed that successful government intervention to provide perpetual price support demands a very high quality of management, capability to resist pressures for higher levels of support, and an ability to forecast future price movements accurately. Also, the level of financial support needed to exact a response is very large, exposing the government to substantial public finance risks if the support is misplaced. The considerable challenge in satisfying these criteria cannot be emphasised strongly enough.

Evidence of welfare effects of short-term price support

The policy of short-term price support during the period from 1990 to 1994 was tested by Fleming (1999e) who simulated the actual value of price support to smallholders in each year of the AGPS scheme. Results are quite disparate, with negative impacts for all but copra smallholders. The negative impacts are quite large for cocoa smallholders but negligible for coffee and palm oil smallholders. Fleming (1999e) discounted the copra results because of information deficiencies that led to doubts about the accuracy of modelling results.

A future policy of short-term price support was also tested by increasing all delivered-in-store prices to within 90 per cent and 95 per cent of their five-year moving average. Funds were assumed to come from the government budget. Separate simulation runs were made for short and long commodity cycles.

As for perpetual price support, there was a wide range of results from the simulation runs for the four tree crop industries. Generally, economic surplus elasticities are low with the exception of copra. But the qualification in respect of copra made above also applies here. Some negative impacts are evident for coffee estates and coffee and cocoa smallholders. The latter results are especially notable given the importance of these two groups in the tree crops sub-sector.

Where there are positive impacts of support, the implications of price trends are mixed. Economic surplus increases tend to decrease with decreases in the product

price trend for cocoa estates and palm oil smallholders, but increase with decreases in the price trend for oil palm estates and copra producers.

Large amounts of public funds would be needed to bring about a significant positive impact on economic surplus. Given the doubts about achieving the desired impacts of short-term price support, it is a risky venture for government to provide this support. Furthermore, the introduction by Fleming (1999e) of stochasticity into price movements demonstrated how easy it is for gains in economic surplus to turn into losses. This can occur as a result of changes in timing and levels of support, misreading of price trends, variations in the length of commodity cycles and increases in the opportunity cost of capital.

As for perpetual price support, government intervention to provide short-term price support demands a very high quality of management and capability to resist pressures for higher and extended levels of support. Allocative inefficiency is also likely to occur because of the distortions in price signals to producers. This can be high in the case of smallholders who have considerable flexibility in varying their labour use during extended periods of low prices.

There are no barriers to entry into or exit from the tree crop industries. Hence, for both short-term and perpetual price support (but especially for the latter), payments distort normal market mechanisms and neutralise market forces in the domestic marketing sector so long as supply responsiveness is different from zero.[41] This has the effect of altering allocation, investment and diversification decisions by producers, processors and marketers. Price support reduces the incentives for tree crop producers (and others in the marketing chain) to move into more profitable and less risky activities, both on and off the farm, by paying them a more stable price above international prices (Duncan et al. 1995). It also acts as an incentive for new producers to enter the industries, introducing the possibility of further efficiency losses.

If the world prices of tree crop commodities had not improved when they did, the AGPS scheme would have encouraged unsustainable practices in the tree crop industries that could have led to a dependency on government support. There is indeed some concern that the AGPS has created a dependency mentality among producers who expect future government support if prices again fall to low levels. The costs of the AGPS might therefore have been high.

Macroeconomic impacts

Kannapiran (1999b) examined the macroeconomic impacts of price support by simulating the provision of this support within his macroeconometric model for Papua New Guinea. He found that it has adverse impacts on the economy that are quite substantial.

Operational feasibility

There is little doubt that the AGPS was unsustainable, acknowledged by its limited life span. But the life of the AGPS was arbitrarily set by basing the threshold price for support only on a supply criterion of cost of production. Inclusion of demand factors such as world prices would have lowered the threshold, thereby reducing the bounty payments and lowering the risk that the price support would have been an infeasible option (Opa 1991).

4.2 Product Quality–Price Relations

4.2.1 Evidence of deterioration in product quality and its implications

Evidence of declines in export prices

The quality of coffee and cocoa in Papua New Guinea has exercised the minds of policy makers for decades. In the case of coffee quality, many commentators, including analysts in CIC, have long believed that declining quality has contributed to depressed coffee prices and perhaps damaged the reputation of Papua New Guinea as a producer and exporter of high-quality green beans. The collapse of coffee prices in the early 1990s prompted CIC and the government to pursue with renewed vigour policy measures aimed at arresting quality deterioration.

McConnell et al. (1999) studied the effect of quality on the price system of coffee in the domestic market, and ascertained the significance of the world price of 'other milds' coffee to domestic price formation. They concluded that the concerns held by CIC and others over deteriorating coffee quality appear warranted. Their results indicate that the prices for all grades exported are being increasingly penalised, and provide prima facie support for greater attention to quality deterioration and policies that may improve the quality of green bean exports.

Implications for product quality management

But McConnell et al. (1999) warned that this does not in itself provide economic grounds to arrest deterioration of the quality of coffee exports, which is primarily a

commercial decision. Improvements in the quality of coffee do not automatically improve industry profitability for two main reasons. First, the potential returns from improving quality are uncertain. Second, the attainment of high-quality coffee is not always the most economic solution. The dangers here are that by attempting to improve the overall quality of coffee, additional costs could be incurred that outweigh gains from price increases. This is not to say that a policy to improve quality should not be pursued. Rather, it should be undertaken only after careful consideration of the likely financial and economic impacts of such actions. The same provisos hold for other tree crop exports.

4.2.2 Price discrimination through grading

Impetus to improve smallholder coffee quality

Price discrimination through grading is a market-oriented approach to increase the export prices of tree crop products. The introduction of new grading schemes can increase the average export price of products without requiring the provision of an indefinite subsidy by the government. Coffee and cocoa exports have been the subject of major quality improvement programs, and the quality of smallholder output has been at the centre of quality improvement efforts in both industries.

Coffee quality was an issue from the inception of the industry in 1956 (Cartledge 1978, p. 18), but it did not become a serious problem until the mid-1980s. Its emergence as an issue coincided with the rise in importance of smallholders as the major exporters of coffee beans. Because smallholder coffee is subject to various production and processing methods, it is thought that the quality of smallholder coffee has remained low as export volume has increased. A market-oriented grading scheme for smallholder coffee was introduced in 1992 to offer greater price incentives for a better quality of green beans (Smith 1992, p. 4). This scheme was expanded to include a superior grade in 1994 (Kuimbakul 1994, p. 17). CIC established a quality control section to set minimum quality standards and monitor the quality of coffee at all levels from the producer to the overseas markets.

Evidence on grading of smallholder coffee

Degemba and Fleming (1999) concluded from the results of their analysis of this smallholder coffee grading scheme that its introduction has been beneficial because it has provided foreign buyers with a quality of coffee that better suits their needs. The position of Papua New Guinea as a coffee exporter has been enhanced by the scheme, and smallholders should have become more competitive in the world market as a result of its introduction. The important role of price as a mechanism in

grading to differentiate and improve quality was emphasised by the results of the study. While price incentives provide the lead, however, interventions to improve quality at various levels in the smallholder coffee export marketing chain also played a part in reinforcing the price incentives. An integrated quality improvement program is still required to consolidate the gains made.

Efforts to improve cocoa quality

Ivarami and Yarbro (1992) argued that quality control is essential in cocoa export because of the characteristics of the cocoa bean, and the nature of smallholder production and marketing. As in the case of coffee, they expressed concern about the problem of declining quality of cocoa beans and the adverse impact this had been having on average export prices. They gave an account of the history of cocoa quality legislation in Papua New Guinea since the Cocoa Industry Act of 1974, and described the Cocoa Quality Improvement Project (Ivarami and Yarbro 1992, p. 172), funded by the Australian Agency for International Development. In their description of the cocoa quality control system introduced in this project, Ivarami and Yarbro (1992) highlighted its reliance on regulation rather than price inducements.

It is difficult to discern any positive effects of the Cocoa Quality Improvement Project. On one hand, low export prices for cocoa in the early 1990s raised concerns about a decline in the quality of cocoa beans (Grey 1993). Yet the proportion of export quality cocoa beans has remained high and fairly constant over the past two decades (Peter 1997, p. 26). The Project may well have offset a decline in quality that would otherwise have occurred. But it is difficult to conclude that any quality gains were reflected in higher export prices, and to assess whether any increase in the value of exports from higher export prices outweighed the costs associated with the Project.

It appears that the market-based solution to quality improvement followed in the coffee example, relying primarily on price differentials through grading, is more likely to have yielded economic gains than the predominantly regulatory approach followed in the cocoa example. In both examples, facilitation has been an important part of the efforts to improve product quality.

Potential gains from niche export marketing

Production for special high-value market segments is a potential growth area that relies on a market segmentation strategy incorporating grading and price discrimination. It is being exploited to a limited extent already through the production of organically grown coffee. There are two key elements for the success of such a strategy. The first is to ensure supply of enough raw material of adequate and reliable quality,

and sufficient quantity. Second, an ability to keep in touch with the changing demands of consumers in these market segments is crucial (Fleming and Antony 1993, p. 331).

4.3 Value-adding through Downstream Processing

Downstream processing is well established in Papua New Guinea for all four tree crop industries under study. It is exemplified by activities such as the milling of palm oil and palm kernel oil, the production of copra, coconut oil and other minor coconut products, and a small roast and ground coffee industry. A good deal of enthusiasm exists for further development of downstream processing activities among politicians, government departments (for example, DAL 1995a, p. 17, DAL 1995b, p. 9) and industry personnel. The Cocoa Board rated the expansion of value-adding activities as a policy priority (Fleming and Yala 1999, Appendix 5). Despite the superficial appeal of such activities, little evidence is available to gauge their potential beyond the downstream processing that already exists.

Tree crop output tends to be exported in a form in which quality is stabilised during the period for which it is stored and transported to overseas markets. In the coffee, cocoa and copra industries, green beans, dried cocoa beans and copra are the respective major forms of exported product. But there is no alternative export opportunity for the raw material or semi-processed product in the oil palm industry. Hence, it is not surprising that the most successful example of downstream processing in the tree crops sub-sector in recent times is oil milling in the oil palm industry. A critical technical factor in this success is the requirement that the oil mills be located adjacent to the production areas because of the rapid quality deterioration of harvested fruit.

Much of the analysis and discussion of the potential for downstream processing of tree crop output in Papua New Guinea has centred on the coffee industry, and experiences in this industry provide a good indicator of this potential. Mitio and Smith (1991, pp. 218–219) identified two prospective areas for further processing beyond the green bean stage. They are processing into instant or soluble coffee, and roast and ground coffee production. Both have been the focus of recent efforts to develop downstream processing, yet neither is likely to be a panacea to the marketing problems faced by the industry.

Mitio and Smith (1991) reasoned that instant coffee production was not an economic proposition. Their opinion was later supported by Hassall and Associates (1997),

who undertook a feasibility study of this option and concluded that even 'under the most optimistic scenario returns are unlikely to attract private investment' (Hassall and Associates 1997, p. x).

While roast and ground coffee production was acknowledged to be the more attractive option, Mitio and Smith (1991) felt that the scope was limited for expanding current activities in this area. Experiences in the small roast and ground coffee industry since the coffee year 1991–92 confirm their observation. Exports in that year increased from low levels throughout the 1980s to almost 50 tonnes of green bean equivalent, then peaked at 96 tonnes of green bean equivalent in 1995–96 (Kuimbakul 1996). However, volumes have since declined, with roast and ground exports static over the past couple of years at just 25 tonnes of green bean equivalent (Stapleton et al. 1999, p. 19). This figure represents just 0.03 per cent of the volume of green bean exports in 1998 (Table 1).

The best forms of government action in downstream processing are to improve the commercial, political and regulatory environments, and to streamline the guidelines and procedures for foreign investment (Duncan et al. 1995, Ch. 7).

4.4 Product Promotion: evidence from the Coffee Industry

Generic promotion suffers from major difficulties in changing consumption patterns (Kohls and Uhl 1980, p. 302). Some minor gains might be possible from promotion of tree crop products that are capable of differentiation in certain market segments. This promotion would need to be based on the quality or other product attributes (such as its derivation from organic production), and the product should be easy to brand (Kohls and Uhl 1980, p. 303). In these cases, it is preferable for the government to leave promotion expenditure to marketers in the private sector, such as exporters and foreign buyers, who can capture the benefits of the promotion.

As for downstream processing, much of the small amount of evidence on generic promotional activities of tree crop products concerns the coffee industry. CIC and its predecessors actively promoted Papua New Guinea coffee in overseas markets in the past. Promotion campaigns were undertaken by the Coffee Industry Board as part of market penetration strategies in New Zealand and United Kingdom (Fleming and Antony 1993, pp. 132–133).

Coulter (1992, p. 39) cited the market entry of the 'New Guinea Gold' brand of coffee into New Zealand in 1985 and 1986 as an example of successful promotion. The campaign was undertaken through a joint agreement with the coffee firm, Robert Harris. Fleming and Antony (1993, p. 132) reported that CIB (1986, p. 40) claimed an overwhelming response to the launch of the 'New Guinea Gold' brand in New Zealand, and Robert Harris accounts showed an increase in consumption of the brand. Similar promotional efforts in 1986–87 were concentrated on the United Kingdom market, again based on 'New Guinea Gold'. Discount vouchers were made available at the retail level, and were supplemented by a competition to produce an action response from consumers (Fleming and Antony 1993, p. 132).

According to Fleming and Antony (1993, pp. 132–133), the evidence of success of the promotion campaign in the New Zealand market is unconvincing despite claims to the contrary. Exports from Papua New Guinea to New Zealand were little changed two years after the campaign even though total exports increased by over 70 per cent during that two-year period. Exports had still not increased five years on. Bodman (1987a, p. 6) submitted that no increase in overall sales to New Zealand could be observed, yet Robert Harris was reporting sharply higher sales of their Papua New Guinea coffee lines. Fleming and Antony (1993, p. 133) concluded from these observations that Robert Harris brands were substituting for other Papua New Guinea coffee being sold to New Zealand. If this were true, the Coffee Industry Board was merely helping one particular company gain market share in New Zealand.

In the case of the promotional campaign in the UK market in 1986–87, Fleming and Antony (1993, p. 133) admitted that the campaign possibly did have some impact, although it was short-lived. They quoted an average share of Papua New Guinea exports to UK for the three-year period, 1984–85 to 1986–87, of 7 per cent. This share increased to 12 per cent in 1987–88 and 1988–89, only to return to 7.5 per cent during the following two years.

---

34 Empirical evidence to support the hypothesis that exporters pass back bounties to tree crop producers was summarised above in section 3.2.2.

35 Stabex loans refer to payments made by the European Union (EU) to governments of developing countries that were former colonies of EU members. The aim of the Stabex scheme is to assist these developing countries achieve macroeconomic stabilisation by countering the effects of instability in export earnings through funds transfer. Some of the Stabex funds received by the government of Papua New Guinea were used to provide loans to export industries to enable them overcome the adverse effects of low commodity prices.

36 The levels selected for price support were K2300/t f.o.b. for coffee, K1300/t for cocoa, K250/t for copra and K261/t for palm oil (Fairbairn 1993, p. 17).

37 Kannapiran (1999d, pp. 30–31) summarised some of the main events that took place during the period of the AGPS scheme:

> The systems of payment of bounties and collection of levies were designed according to the specific marketing arrangements of each industry. In the case of coffee, the bounties and levies were based on average of three months' export contracts (past, present and next month's) and the guaranteed price (or trigger price for levies). Changes to the rate of bounty or levy were effected only when the variation in the average price was more than 10 per cent. In July 1994, the average export contract price for coffee rose above the guaranteed price and the bounties ceased. By August 1994, levies should have been collected at the rate of 50 per cent above the trigger price, but the Coffee Industry Corporation failed to apply the formula detailed above.
>
> In response to the high cost of the AGPS scheme, in August 1994 the government revised the rate of levy for all crops from 50 per cent to 65 per cent of the difference between the trigger price and the market price. Simultaneously, the buffer between the guaranteed price and the trigger price was reduced from 25 per cent to 10 per cent. In 1995, without any strong reasons, the rate of levy was returned to 50 per cent of the trigger price and the buffer was increased from 10 per cent to 26.5 per cent.

38 But this has not prevented individual industry organisations from considering their reintroduction. The board of CIC has given preliminary approval to proceed with a coffee industry stabilisation fund (Stapleton et al. 1999, p. 2).

39 Over one-half of the support funds went to the coffee industry. Given their predominance, coffee smallholders were the main recipients.

40 That is, producers regard export price as the only true measure of long-term price trends in the world market when deciding whether to plant and what area to plant. In this case, they are unlikely to be influenced by current price support that might be removed by the time trees or palms are fully bearing.

41 This appears to be the case for three of the four crops (Livingstone 1989, Fleming 1999a,b, McLaren and Fleming 1999). Ruhle and Fleming (1999) were unable to find a significant and positive supply response to price by cocoa producers. However, Livingstone (1989, p. 128) found that 'evidence exists, supported ... by the survey results, of the supply responsiveness of growers of cocoa and copra, and policies in future should be based on the assumptions of positive supply response and economic motivation in both cases'.

CHAPTER 5
FACTOR MARKET POLICIES

Four factor market policies are considered in this chapter:

- *subsidisation of purchased inputs commonly used in tree crop production*
- *counter-cyclical planting and maintenance subsidies*
- *rural wage policies*
- *agricultural land tenure.*

5.1 Input Subsidies

Nature of input subsidies

Production subsidies are often referred to as implicit export subsidies, usually adopted to improve producer income and international competitiveness. If there is a sub-optimal demand for inputs, input subsidies in the initial stages of development of an industry could stimulate production and create welfare gains to the tree crops sub-sector and society in general. This is subject to the proviso that adequate levels of these inputs are made available to producers.

The government in Papua New Guinea has introduced subsidies on inputs to compensate for constraints such as low world commodity prices, poor roads, natural disasters and inflation. The Smallholder Market Access and Food Supply Project is an example in respect of lack of accessibility to markets and services (DAL 1992).[42] Input subsidies have also been used to generate higher productivity and production of tree crop exports. Examples have occurred in the Smallholder Cocoa/Coconut Rehabilitation and Expansion Project, Smallholder Coffee Rehabilitation and Expansion Project, New Ireland Village-Based Oil Palm Development Project, Oro Smallholder Oil Palm Expansion Project, Milne Bay Oil Palm ad Cocoa Scheme, Smallholder Rubber Production Project, and various projects involving smallholder settlement schemes (DAL 1995a, pp. 9–11).

Production subsidies can be classified as open-ended (deficiency payments) or specific (for example, on fertiliser, interest rates and tree rehabilitation). Specific production subsidies are used to lower production costs and, in the case of many food outputs, domestic prices. For tree crops, lower production costs lead to a downward shift of the export supply function and a subsequent expansion in output and exports. International prices are not affected, in that producers in Papua New Guinea are price takers in the world markets of all tree crop products, and so

producers' surplus is increased. But allocative inefficiency may occur if resources are moved from more profitable pursuits in other sectors of the economy to meet the subsidised expansion of production.

Potential for conflict with current economic strategy

DAL (1994, p. 16) recommended the subsidisation of inputs as a policy instrument. The prevailing policy environment does not encourage input subsidies, however, emphasising instead economic reform and a retreat by the government from direct intervention in factor markets. Provincial governments are being advised to limit subsidies on agricultural inputs, granting them only to economically viable activities and where access to credit is lacking (DAL 1995a, p. 18).

Input subsidies

Input subsidies are 'second-best' policy solutions, usually designed to offset other distortions (poor roads, unduly low world prices, and so on) that are perceived to affect producers adversely. The effectiveness of an input subsidy depends on the elasticity of supply with respect to input prices. A more elastic output supply curve implies a lower resource cost to achieve an output response. In the tree crops sub-sector in Papua New Guinea, the short-run elasticity of supply is expected to be highly inelastic with respect to input prices (Fleming 1999a,b, McLaren and Fleming 1999). The one possible (and important) exception is family labour on smallholdings, but this input is supplied largely outside the labour market system and cannot be easily subsidised.

Provision of input subsidies suffers from the drawback that it requires effective support services, such as reliable input markets, market outlets and extension services. Such conditions are frequently absent in Papua New Guinea.

Fleming (1999e) tested a policy of a subsidy on purchased inputs that reduced the prices to tree crop producers of all purchased inputs by 10 per cent. It was assumed that the subsidy would be funded out of the government budget. Results show that the positive output effects of the subsidies tend to be quite small and, in general, do not outweigh the opportunity costs of the funds used in providing the subsidy. Negative subsidy elasticities of economic surplus are very high for coffee and oil palm estates, both of which are fairly large users of purchased inputs. Losses increase with the change from an increased trend in product prices to a decrease. This implies that welfare losses from input subsidies for coffee and oil palm estates would be large if world coffee and palm oil prices trend downwards in the future.

An important caveat to the above assessment is that Fleming's (1999e) analysis assumes a static environmental state in which production takes place. Historical data were used to estimate the production relations on which the simulation runs were based. To the extent that the production environment is degrading over time and purchased inputs begin to have much greater marginal effects on output, these results will underestimate the positive impacts of subsidised inputs on industry output and surplus.

5.2 Counter-cyclical Tree Planting and Maintenance Subsidies

Provision of seedlings as a special type of input subsidy

Tree planting subsidies are a form of investment incentive that has been a regular feature in the tree crop industries. They have included the occasional grants. For example, seedlings were distributed to cocoa and coconut farmers in the provinces of North Solomons and East New Britain as part of a rehabilitation strategy (DAL 1995b, pp. 17–18). More commonly, the seedlings are sold at subsidised prices.[43] The research organisations(CCRI, Coffee Research Institute and PNG Oil Palm Research Association) have mainly been given the responsibility to grow and distribute subsidised seedlings.

Planting investment decisions in Papua New Guinea are likely to have been influenced by the extensive subsidisation of tree plantings.[44] When producers face uncertainty about the outcomes of their investment decisions, they tend to 'set aside a certain amount of resources to face possible future changes in income levels, interest rates, taxes, or any other consumption determinant' (Loayza et al. 1998, p. 4). Planting subsidies have the potential to reduce the uncertainty about future returns from plantings in that the reduced expenditure on the initial investment enables a reallocation of funds to finance future tree maintenance costs. Accordingly, incentives for traditional saving and investment by smallholders through tree planting can be significantly reduced.

A policy of counter-cyclical planting subsidies was tested by Fleming (1999e). He assumed that the government would pay for all costs of planting and early maintenance of trees and palms where there is a planting shortfall below 90 per cent of a 5-year moving average of areas of new planting. His simulation results show positive but low elasticities of economic surplus in respect of both public

funds committed to the subsidy and the area planted. The elasticities understandably become higher with increases in the trends in product prices. They are highest for coffee estates but, even here, are still well within the inelastic range.

5.3 Rural Wages

A brief history of minimum wage legislation

A substantial rise in real wages occurred in the early 1970s in Papua New Guinea, due in large part to a minimum urban wages policy that was put in place in 1972 and continued until August 1992. Wage indexation was maintained until 1983 under a system inherited from Australia (Jarrett and Anderson 1989). These wage-fixing procedures kept real wages constant and maintained urban wages at approximately 2.7 times the rural wage (Jarrett 1990). They heavily distorted minimum wages for unskilled people (Levantis 1997, p. 54). This inevitably encouraged rural people to migrate to the urban areas (Fallon, King and Zeitsch 1995, pp. 66–67), and therefore out of the agricultural sector. The limited number of urban jobs available subsequently led to high unemployment, exacerbation of law and order problems in towns, and lower GDP.

Implications of minimum wages for tree crop industry costs

The upshot of the minimum wage policy was that industries in Papua New Guinea found it difficult to compete in international markets until the mid-1990s (Fallon et al. 1995, pp. 66–67). The only exceptions were primary industries in which competitiveness was maintained by abundant natural resource endowments. Yet, even in industries in the tree crops sub-sector, wages relative to productivity have a substantial influence on competitiveness (Kannapiran 1999c).

There is a body of evidence to show that wages in the cash crop economy of Papua New Guinea are higher than in its trade competitors. ICCO (1990) estimated costs of rural labour in cocoa production that were three to four times higher than wage costs in Brazil, Nigeria, Ghana and Indonesia. Recent international wage comparisons suggested that average agricultural wages in Papua New Guinea were 19 to 20 per cent above Asian agricultural wages and 30 to 65 per cent higher than those in Southeast Asia (McGavin 1993). Given that labour is the most important production input in the tree crop industries (Kannapiran 1999c), this relatively high labour cost has adversely affected their international competitiveness.

Moreover, tree crop producers have been disadvantaged by the effects of high non-farm wages on prices of purchased inputs and marketing services through expansion of their cash sales and input purchases (Jarrett and Anderson 1989).

Recent labour market reforms

In 1992, the Minimum Wage Board recommended a large reduction in minimum urban wages and abolition of wage indexation in an attempt to unify urban and rural wage rates in Papua New Guinea. In the rural areas, the 'capacity to pay' criterion was introduced whereby changes in wages were to be determined by collective bargaining (McGavin 1993). CIC (1992, p. 9) made a strong case for a more flexible approach to setting wages in rural areas that would allow wages to vary in line with economic conditions facing producers. In any event, estates tend to pay above the minimum rate in periods of reasonable prosperity. The rate only comes into force when economic conditions are unfavourable.

The World Bank recommended a wage freeze in 1995 as part of the structural adjustment program, and required the government to abolish the statutory minimum wage. In consequence, a substantial decline occurred in real wages for both skilled and unskilled labour (Levantis 1997, p. 54). Zeitsch et al. (1993, p. 13) estimated that a 10 per cent cut in real wages would lead to increases in the output of coffee by 8.2 per cent, cocoa by 8.3 per cent, palm oil by 5.6 per cent and copra by 7.1 per cent. The lesser increase for palm oil output reflects the lower cost share of labour in this industry.

Continuing obstacle of weak workforce skills

Despite labour market reform, the problem of weak workforce skills has not been addressed (Economic Insights 1994). Low skill levels interact with relatively high wages and interest rate and other subsidies to bias the choice of factor inputs towards capital-intensive rather than labour-intensive production techniques. This further squeezes employment opportunities (Jarrett 1990). The net effect of distortionary policies in the input markets has been a decline in aggregate production, particularly in agricultural export industries such as those in the tree crops sub-sector.

Labour market-induced changes in opportunity costs

The opportunity cost of labour varies with market forces in rural areas, as demonstrated by two examples. First, opportunity costs have risen sharply in areas adjacent to major resource developments, such as mining projects. Second, changing economic conditions in the horticultural industries in the Highlands affect the derived demand

for labour in coffee production through changes in the relative profitability of vegetables and coffee. There is little that the government could do, or indeed should do, to counter these effects.

Impact of changes in opportunity costs of labour on profitability

Fleming (1999e) demonstrated the importance of the opportunity cost of labour to industry profitability. He simulated a 10 per cent increase in the opportunity cost of labour in the four tree crop industries, with separate runs for smallholders and estates. Results reveal high and negative estimated wage elasticities of economic surplus. The elasticity is lowest for the oil palm industry; it is below unity only in the case of oil palm smallholders.

5.4 Rural Land Tenure

5.4.1 Background to the land tenure system

Land is obviously a key input in the tree crops sub-sector in Papua New Guinea. Almost 97 per cent of land is held under a customary land tenure system. The other three per cent is made up of alienated land, of which only one-half is formally accounted for. Of the alienated land, one-twentieth is in freehold, one-tenth is used for public purposes and one-third has been leased to private parties under a 99-year leasing agreement (Grey 1993). Property rights to customary land are determined on the basis of the *as graun* principle whereby the rights over land pass to the descendants of the person who first cleared and used it (Giddings 1981). This entitles clans to grant right of ownership of a parcel of land to individual families but not to transfer it to others (World Bank 1988).

Attempts at land reform have so far been unsuccessful. This failure has been attributed to a number of causes: a lack of participation by those affected; the dominance of foreign experts and consultants; vested interests; lack of finance; a lack of skilled manpower; and the constraints of the land tenure system itself (Lakau 1985).

Progress towards formal titles has also been hampered by the legal and administrative difficulties in transfer and registration. On the legal side, major attempts began in 1952 with the Native Land Registration Act, which aimed to register all indigenous holdings. The Land Commission was to adjudicate on ownership of individual plots in cases where owners applied for determination. However, they failed to register anyone under the Act (MacWilliam 1991). An amendment was made to the Act in 1987,

extending the possibility of lending to individuals and business groups land that was previously held under customary tenure. The Rural Development Bank of PNG (RDB)[45] helped fund the indigenous takeover of landholdings, consequently developing the lease-lease back arrangement to extend loans to smallholders (see section 6.2.3).

Attempts have been made to develop customary land for agriculture within the existing system. In 1972, a Commission of Inquiry into Land Matters was formed under the new independent government. In 1973, 123 recommendations were made that recognised the traditional base as a suitable starting point for tenure reform (Lakau 1985). However, few of these recommendations were implemented.

Further attempts at land reform were made through the Land Settlement Schemes and Disputes Settlement Schemes. Land Settlement Schemes aimed to improve the efficiency of land use and government infrastructure in order to increase the involvement of people in the cash economy. The Land Disputes Settlement Act (1975) was passed to incorporate settlement processes of disputes by customary means. Under the 1976 Land Act, only nationals are allowed to acquire freehold land (Lakau 1985).

The 1984 Land Administration Improvement Project was set up to counter difficulties related to land tenure administration. It concentrated on improving land information, department efficiency, and provincial and national land administration procedures. The Land Evaluation and Demarcation Project was drafted in 1985 to consolidate the impact of the Land Administration Improvement Project. Its objective was to facilitate the implementation of agricultural and forestry projects through improved land administration, land resource evaluation and mapping activities. The World Bank revised both projects in 1988, and plans were made to integrate the Land Evaluation and Demarcation Project into the Department of Land and Physical Planning in 1989 (Turtle 1991).

Reorganisation of the structure of the Department of Land and Physical Planning came into effect in 1986. The emphasis was on land development in the provinces, since provinces had been isolated by centralised legal requirements of the land administration system (Turtle 1991). A computerised land information system (PNGLIS) was completed in 1987, addressing the problem of information deficiencies.

Recently, the government of Papua New Guinea, Australian Agency for International Development and World Bank funded a five-year Land Mobilisation Programme. The Programme created an inventory of unleased alienated land, supported

attempts to register customary land, decentralised certain land administration activities to the provinces, and attempted to strengthen the Department of Land and Physical Planning (Jarrett 1990). However, little success has thus far been achieved in mobilising customary land for agricultural development, especially the development of tree crops given the quasi-permanent fixture of tree plantations.

5.4.2 The existing land tenure system

Views differ on the suitability of the existing land tenure system for agricultural development, in general, and development of the tree crops sub-sector, in particular. These differences are underlined in this section.

Arguments in favour of the existing land tenure system

Bingswanger and Deininger (1997) undertook a thorough and authoritative assessment of the impact of customary, communal land tenure on agricultural development in developing countries as a whole. They were especially concerned with the efficacy of communal land tenure compared with its main alternative of private property rights. Their observations have particular relevance to the development of the tree crops sub-sector in Papua New Guinea:

> ... in environments where information costs are high and markets for finance and insurance are imperfect, private property rights do not always produce the most efficient farming arrangements. Abandoning communal land rights for fully tradable property rights may lead to the loss of safety nets for the poor, the use of economies of scale in herding, or measures to diversify risk ... . Furthermore, the process of assigning and transferring private property rights is not cost-free. The costs of maintaining records, negotiating, contracting, and policing property rights can be high and may exceed the value of the land, especially in rural areas with low population densities and little market access.
>
> Communal types of land tenure assign to community members clear inheritable use-rights to cropland, pastures, forests, and fisheries, and usually allow some degree of exchange (rental or even sale of land) within the community. They often provide security of tenure at low cost, and thus do not discourage individuals from investing in the operation [such as planting tree crops] ... . Because the use of the land and its output belong to individual cultivators, communal property rights systems rarely lead to large static efficiency losses(unlike collective farming systems. Fully individualized property rights systems become superior to communal systems only once population growth and specialization increase the value of land and the efficiency losses associated with restricting transactions to insiders.
>
> (Binswanger and Deininger 1997, p. 1966)

The current state of tree crop production in Papua New Guinea suggests that it will be some time before conditions evolve that render private property rights superior to communal property rights on these criteria. Nevertheless, it is acknowledged that tree cropping has hastened increased individualism in land tenure arrangements (for example, Grossman 1984, p. 246, Brown, Brookfield and Grau 1990, p. 21).

The existing system of communal land ownership[46] in Papua New Guinea has been credited with ensuring social stability and easy access to land within clans. Brogan (1981, p. 44) asserted that:

> ... communal ownership of land in Papua New Guinea obviates the need for some forms of social security payments(like old age, sickness and unemployment compensation. If the land was 'nationalised', a more formal system of social security would be required. The budgetary cost of this would have to be set against a more 'modern' and 'efficient' land transfer system.

Shaw (1985, pp. 153-155) does not attempt to disguise the fact that the current system can create difficulties. But he also mounts a persuasive case for its retention:

> Customary land is still being allocated and re-allocated within customary land-owning groups according to the needs of its members and the customary laws which have developed over long periods of time. These laws show themselves to be continually evolving and flexible, and have avoided the creation of a rural landless or dispossessed class which has emerged in most Asian countries.
>
> (Shaw 1985, p. 154)

Overfield (1991b) found that respondents to his survey considered access to land to be the factor least constraining coffee production. It was also considered the major constraint by only 12 per cent of respondents in a study in Milne Bay Province by the Institute of Marketing and Research (1992, p. 3). This finding cannot necessarily be generalised to all smallholder tree crop production, or to blockholder and estate production. In any event, widely varying population densities make such a generalisation unwise. But it is clear that, to most smallholders, factors other than land access are more important in limiting tree crop production at present.

Arguments in favour of radical land reform

On the other hand, some analysts hold the view that agriculture (especially the expanding tree crop economy) is critically constrained by the land tenure arrangements, even where there is an abundance of unutilised land. Their view is that the land tenure system tends to protect the land occupants rather than facilitate

development (World Bank 1988). As a result, only 1.2 per cent of land is used for agriculture of which three-quarters is under tree crops. The total area per head is high by world standards but the amount of land used for agriculture per farm worker is less than one-tenth for the average developing country (Jarrett and Anderson 1989).

According to Tietenberg (1992, p. 45), an efficient structure of property rights has four major characteristics:

- universality, where all entitlements are completely specified
- exclusivity, where all benefits and costs of using the resource accrue to the owner
- transferability, wherein all property rights can be transferred from one owner to another in a voluntary exchange
- enforceability, where security rights are free from involuntary seizure or encroachment by others.

The World Bank (1992, p. 1) felt that these characteristics do not exist under the existing customary land tenure system in Papua New Guinea. It recently suggested registering agricultural land as freehold as part of the current structural adjustment program. Because transferability is not allowed and involuntary seizure is normal practice in determining land ownership, the World Bank (1992) contended that agricultural productivity improvements do not become capitalised into the value of the land. Hence, there is little incentive to improve its productivity, given that the full value of the productivity increase can never be fully appropriated. It further prevents the aggregation of land and therefore the realisation of economies of scale that may be available. In addition, it cannot be used to secure a loan for investment purposes (Fallon et al. 1995, p. 109). The suggestion for land reform made by the World Bank was not followed through because of the political heat it generated and the complexities of clan and sub-clan title rights.

In regard to land disputes, the Land Disputes Settlement Act (1975) has not enabled dispute settlements to be satisfactorily resolved. It is widely believed that the government has failed to address the root cause of disputes, being concerned more with building their police force and correctional services than dealing directly with the problem (Lakau 1985).

A legal constraint relates to the entitlement of land. Under the Land Act, even the very small area of land that has a freehold or leasehold title cannot be sold to non-nationals. Furthermore, nationals do not highly value the certificate of title, out of

fear of clan conflicts with those who have a customary right over the land. This has created most problems for expatriate estate owner-operators who have had difficulties in disposing of their assets. Local businesses do not have the financial resources to purchase and rehabilitate the estates, and the Plantation Redistribution Scheme legislation has also impeded the restructuring of the estate sector (Stein 1991). Hence, there is a major divergence between the private and social values of land, leading to underutilisation and underinvestment in land improvements (Jarrett and Anderson 1989).

Land settlement schemes undertaken within the existing land tenure system have not been economic successes. These schemes have been hampered by falling commodity prices, a problem that cannot be blamed on the land tenure system. But they have also suffered from the absence of a well-directed policy, and social problems have been rife. Traditional landowners on the fringe of these settlements have suffered most, due to a lack of their integration into the schemes (Lakau 1985).

Two initiatives identified by Allen (1993, p. 17) fit a conservative approach to land reform within the existing land tenure system. They are 'mapping clan land boundaries and recording the occupier/owners of the land using a computerised version of the colonial Village Book; and ... [providing] the legislation necessary for the registration of group land and the leasing of group land to internal or outside commercial interests, while retaining an interest in the land on behalf of the customary owners'.

---

42 This project was directed towards increasing food production in less developed areas through better road access and improved provision of better, and wider range of, extension services to food producers (DAL 1995a, p. 6). Nevertheless, some of the subsidies in the project inevitably flowed to tree crop production because of the mixed cropping systems practised by farmers in these areas.

43 Despite the claim by DAL (1995a, p. 18) that coffee seedlings are sold 'at about market prices', for example, it would be more accurate to say they are sold at a price close to the cost of production.

44 This is consistent with the so-called 'option approach', which is 'to buy an asset at different points in time, balancing the value of waiting with the opportunity cost of postponing investment decisions' (Schmidt-Hebbel et al. 1996, p. 104). The option approach requires modification of the standard discounted cash flow analysis such that 'the anticipated return on the new investment project must exceed the purchase and installation cost by an amount equal to the value of keeping the investment option alive'. Translating this approach for the tree crops sub-sector, producers would take into account the cost of maintaining new tree plantings when making decisions to invest in new plantings or replantings, particularly during the gestation period when opportunities for earning cash are limited.

45 Formerly known as the Agriculture Bank of Papua New Guinea, it is referred to hereafter as RDB.

46 There are two types of customary land tenure described in law in Papua New Guinea: householders as smallholders, and industrial and agricultural capital holding rights of concentrated property (MacWilliam 1991, Overfield 1995, p. 71).

CHAPTER 6
RURAL FINANCE

There are two dimensions to a rural financial system, saving and credit, that are covered separately in the sections that follow. It is concluded that both dimensions require attention for sustained development of a rural financial system. Rural saving has not figured prominently in analyses of agricultural policies in Papua New Guinea, with most emphasis historically placed on rural credit. This bias is a feature in many developing countries, and is unwarranted (Adams 1988).

6.1 Rural Saving

6.1.1 Benefits of improving rural saving facilities and services

Public neglect of a rural saving policy

The level of domestic saving in Papua New Guinea is inadequate to generate the higher levels of investment that are needed in economic activity (Duncan et al. 1995, p. 2). An indication of the neglect of rural saving in agricultural policy making in Papua New Guinea can be seen from its absence in discussions of agricultural strategy and policies by DAL (1994, 1995). Even Shaw (1985, pp. 110–114), in his comprehensive survey of agricultural policies, focused solely on agricultural credit. Yet formal saving and investment by private individuals in rural areas, especially by smallholders, are often constrained by an absence of reliable, accessible and remunerative financial facilities. Removal of this constraint enables farmers to improve their ability to reduce their financial risks and make their own arrangements to smooth the flow of income and consumption, rather than depending on government support and stabilisation schemes (see section 3.7). Financial services also enable smallholders to save for investment in new technologies to improve their productivity.

Rural households can use their savings to increase incomes and reduce risk

Fleming (1999e) measured the extent to which higher interest rates on saving deposits and more accessible saving facilities increase the attractiveness for tree crop smallholders to save and dissave in order to stabilise their consumption over time. Also, improved rural saving facilities and services offer smallholders five potential advantages to increase their overall incomes while reducing the risks of fluctuating incomes (see section 3.2.2).

First, the use of saving and dissaving to even out income for consumption over time offers individual smallholder households producing tree crops much greater flexibility than is afforded by commodity price stabilisation schemes. These households are

likely to face different circumstances and have different priorities. They would be more capable of implementing a set of financial practices that suit their needs if they had at their disposal a better and wider array of financial instruments and services.

Second, the stabilising measures of saving and dissaving are directed to income and not price, as is the case with commodity price stabilisation schemes. It is quite possible for price and quantity supplied to move in opposite directions, so that stabilised prices do not necessarily translate into stabilised incomes.

Third, commodity price stabilisation schemes run the risk of distorting market price signals to producers. This risk is avoided when relying on individuals to manage their own market price risks.

Fourth, better rural saving facilities encourage a more productive economy by mobilising savings for productive investment by smallholders producing tree crops. Improving the investment climate in general also encourages greater saving and investment activity throughout the economy.

Finally, higher household incomes are likely to reduce the perception of risk by tree crop smallholders. With higher incomes, they can better deal with the possible negative pay-offs of risky but potentially remunerative production decisions. Rural people in Papua New Guinea tend not to face the dire consequences that are faced by numerous farm households in developing countries if a risky decision goes wrong. Outcomes such as starvation of family members are absent. Many households nevertheless live close enough to, or below, the poverty line that income fluctuations can have substantial implications for family welfare.

6.1.2 Financial liberalisation and saving rates

Fleming (1999e) concluded that policy makers should resist the temptation to rely solely on financial liberalisation to increase saving levels in Papua New Guinea. There is evidence elsewhere in the developing world, reviewed by the World Bank (1999), that financial liberalisation generally leads to increases in real interest rates. But it does not always translate into increased saving in the short term:

> Financial liberalization that includes interest rates usually results in a rise in real interest rates on deposits. This means that each unit of resources saved yields more interest income, reducing the need to save. But the 'price' of current consumption rises with interest rates: households might save more because a unit of income saved now would yield greater interest income in the future.

> Liberalizing interest rates will increase saving only if this intertemporal substitution effect overcomes the income effect.
>
> There is no consistent evidence supporting a positive net effect of liberalization on saving. If liberalization expands the supply of credit to agents that had been credit-constrained, this can reduce saving, because easier access to credit reduces the need to set aside resources in anticipation of adverse income changes.
>
> (World Bank 1999, p. 3)

The above findings need qualification. Reynoso (1988) found that the interest rate elasticity of saving in developing countries was not constant. An increase in interest rate would have a positive and significant impact on saving at low or negative rates. At high interest rates, however, no increased saving would result from an increase in the rate. In Papua New Guinea, as shown by Fleming (1999d, Figure 1), savers have faced low or negative real interest rates on deposits for the past decade. Financial liberalisation that leads to higher real interest rates on deposits would therefore be expected to increase the saving rate, especially in rural areas where saving is likely to be very unattractive at present. Yet there is little evidence of a positive relationship between interest rates and private saving in Papua New Guinea.

Private saving increased substantially between 1989 and 1993 (Duncan et al. 1995, p. 45) when real interest rates were negative, and were generally lower during the 1980s (Duncan et al. 1995, p. 45) when positive real interest rates existed. However, the effects of public and foreign dissaving in the early 1990s largely explain this phenomenon (see below), and appear to mask a positive relationship.[47] Kannapiran (1999b) found that the real interest rate has a strongly significant and negative impact on private consumption. This result implies a positive impact of the real interest rate on private saving under the assumption that all other factors influencing personal disposable income remain unchanged by variations in the real interest rate.

There are three other complicating factors associated with financial liberalisation that need to be taken into account. First, reinforcing the above observation by Reynoso (1988), financial liberalisation that leads to financial deepening is likely to increase the saving rate in the long run through its indirect impact on growth (Schmidt-Hebbel, Servén and Solimano 1996, Loayza et al. 1998). Another reinforcing factor is that financial development could be expected to lead to an increase in confidence by small savers in the financial system, a sentiment that currently is sorely lacking in Papua New Guinea. Greater confidence in the system is likely to encourage people to make greater use of formal saving facilities. On the other hand, most studies on

the relationship between financial liberalisation and saving are aggregate in nature, and financial liberalisation need not affect everybody equally. In Papua New Guinea, there is a risk that commercial providers of financial services will reduce their presence in rural areas with financial liberalisation. This is especially likely in more remote and crime-prone areas where many tree crop producers are located, as it becomes increasingly unattractive to service people in these areas relative to urban dwellers.

It is concluded that financial development in Papua New Guinea is needed to encourage increased saving in the tree crops sub-sector. But this development should not be restricted to financial liberalisation that leads to higher real interest rates. Policy makers need to pay more attention to the saving side of the financial system, particularly in encouraging financial innovations that ensure attractive and accessible deposit facilities are available to rural inhabitants.

6.1.3 Fiscal incentives to encourage saving in tree crop industries

In their review of available empirical evidence, Schmidt-Hebbel et al. (1996, p. 102) concluded that tax incentives to save would be an inefficient way to increase private saving. The evidence they summoned relates mainly to developed countries, yet it is strongly suspected that such incentives would be even weaker for small rural producers who are unlikely to be directly affected by fiscal initiatives to any significant extent. Therefore, use of fiscal incentives is not recommended as a way to increase the saving rates of producers in the tree crops sub-sector.

6.1.4 Do public saving and foreign resource inflows 'crowd out' or 'crowd in' domestic private saving in tree crop industries?

Loayza et al. (1998, p. 23) concluded from the empirical evidence they surveyed in developing countries that saving in the public sector is the most direct fiscal instrument to increase national saving. This is because an increase in public saving is only partially offset by a reduction in private saving. They reported that 'a permanent increase in public saving by 4% of GNDI [gross national disposable income] will raise national saving by some 3% of GNDI within a year, but by only 1.5% in the long term'. There is no strong evidence on such a relationship in Papua New Guinea, and some simple analyses fail to support this relationship and indeed support the opposite finding.[48] They are consistent with the view of Duncan et al. (1995, p. 2) who argued that excessive government consumption draws private savings away from more productive uses.

A crucial issue for Papua New Guinea is whether foreign resource inflows crowd out domestic saving. From their review of the empirical evidence, Schmidt-Hebbel et al. (1996, p. 101) concluded that:

> First, empirical estimates of the effects on saving of foreign aid (and of foreign saving in general) vary widely with the samples, model specifications, and empirical methods used. Second, the extent of resource fungibility is a critical determinant of the extent to which nonconcessional external loans and foreign aid are channeled into higher domestic consumption or investment.

It is difficult to draw any unambiguous conclusion from the general literature on saving in developing countries about the impact of the large foreign resource inflows into Papua New Guinea on saving in the tree crop industries. The most convincing empirical evidence in Papua New Guinea comes from Kannapiran (1999b), who found that foreign investment has a significant and positive impact on private investment. On the issue of fungibility, only a very small proportion of foreign inflows goes to tree crop industries and a high proportion goes to what are largely enclave activities in the minerals and energy sector. In this case, the impact of changes in foreign flows on saving in the tree crops sub-sector is expected to be minor.

Foreign inflows played an important role in the recent AGPS scheme for which the European Union provided K71.9 m, or 27.5 per cent, in Stabex funds (Kannapiran 1999d). There is no available evidence of the impact of this support on consumption and saving by tree crop producers. Probably, the main effect would have been to maintain consumption levels in the face of low world prices, particularly in smallholder households (Kannapiran 1999b). However, a possible consequence could be a diminution of their precautionary saving in that they would expect the government to come to the rescue in the future when output prices remain low for extended periods.

Foreign aid potentially increases productivity, thereby raising both saving and investment levels, although its direct influence on the tree crops sub-sector has not been great. Nevertheless, recent events suggest some positive influence. The tree crop industry that has benefited most from foreign capital inflows over the past two decades has been the oil palm industry. Direct foreign investment has complemented public infrastructure investment to develop a profitable and important agricultural industry that has benefited many smallholders as well as estates.

The two main channels of investment of foreign aid funds are externally funded investments in research and extension, and public investment in infrastructure. Evidence on the productivity effects of the impact of aid-funded research and

extension in tree crop industries is sketchy at best. It is probable that some investments have raised labour productivity and incomes, leading to greater saving capacity, although the overall impact is likely to have been in the small to moderate range. The issue of public investment in productivity-raising agricultural activities is taken up in the next section.

6.1.5 Complementarities between productivity gains and saving

Schmidt-Hebbel et al. (1996, p. 95) maintained that public investment in economic infrastructure such as roads, wharves, bridges and telecommunications strongly complements private investment (see section 8.2), and can lead to a virtuous cycle of increased incomes and higher levels of saving and investment. This virtuous cycle has been clearly demonstrated in the scenario analyses undertaken by Fleming (1999d). An increase in economic surplus from tree crop production arising from productivity gains has the potential to increase saving that in turn leads to greater investment by producers in these industries.

On the other hand, public investment that competes with private investment is likely to 'crowd out' private investment, and be negatively correlated with economic growth. For example, the recent investment by the Copra Marketing Board, a statutory authority, in and operation of a coconut oil mill in Papua New Guinea is likely to squeeze out private investors in the coconut products industries.

Much depends on the quality of the public investment in infrastructure, research and extension, a point stressed by Schmidt-Hebbel et al. (1996). This is much more a problem with agricultural industries than with manufacturing and service industries because of the location-specific nature of public investment in the former. With the long production cycles of tree crops, it is especially important to get public investments in the tree crops sub-sector right, in order to create an environment for productivity gains and exploit the potential complementarities with private investment (as largely achieved in the oil palm industry).

6.1.6 Practical obstacles to improving rural financial systems

The challenge ahead of the government in Papua New Guinea to develop the financial system should not be underestimated. Financial deepening and widening take considerable time and effort in developing countries,[49] especially in rural areas, and probably increase the risk of 'financial fragility' and advent of a banking crisis in the absence of a robust financial system (Demirgüç and Detragiache 1998). Government presence in the financial system in Papua New Guinea needs to be

improved in terms of the roles of institutions and codes of practice. As Duncan et al. (1995, p. 90) asserted, 'the overwhelming priority for the government at this time is to reverse its tendency to increase risks faced by the [financial] system, reduce the claims it makes on the financial institutions, and focus more intensively on those actions it can take to reduce the costs of financial intermediation'.

In particular, the government can play a crucial role in developing financial links between the main financial institutions and intermediaries closer to private savers in rural areas. Only by building confidence in the saving component of the financial system can the government hope to encourage a modification of behaviour by rural inhabitants that leads them to save more out of their incomes.

It would be inappropriate at this stage to recommend a saving and dissaving strategy in tree crop industries based solely on deposits at formal financial institutions as an immediate remedy to revenue instability. Alternative saving and investment opportunities, however, should be available that are remunerative to smallholders, whether on-farm or off-farm. As for on-farm opportunities, production research that improves productivity in the tree crop industries offers a major avenue for investment by producers in inputs embodying improved technologies (see Chapter 7).

6.1.7 Evaluation of the potential to improve rural saving

The results of research work undertaken in Papua New Guinea and elsewhere in the developing world suggest that, for the tree crops sub-sector in Papua New Guinea:

- Potential exists to increase the incomes of producers, especially smallholders, through better saving and investment opportunities. The important role of mobilising savings for investment purposes in tree crop industries is thereby enhanced.
- At the same time, smallholders could take advantage of improved saving facilities and services to reduce variability in their consumption levels through saving and dissaving. Smallholders can then tailor their cash flows to meet their consumption needs better than commodity stabilisation schemes are able to do, obviating one of the main arguments for the reintroduction of such schemes.
- There is a trade-off between increasing levels of income and reducing its variability. But this trade-off can be reduced if smallholder households increase their saving rates, increase their incomes, and are afforded higher rates of interest on their deposits.

- The government should do more to increase saving and investment by producers through better policies, but getting the right mix of incentives is a difficult task. A key element in its financial development strategy should be to pay more attention to the improvement of saving facilities in rural areas. A special effort is needed 'to rehabilitate the savings and loans system that once played an important role in mobilising rural savings' (Duncan et al. 1995, p. 90).
- Financial liberalisation alone is not guaranteed to increase saving rates: a more interventionist policy approach is required, but not the sorts of intervention that place extra pressure on institutions in the financial system. This approach should be based on building a stronger financial sector, by facilitating the provision and innovation of financial services and regulating to safeguard deposits, rather than active participation.
- A judicious mix of complementary public saving and investment activities can reinforce private saving in the tree crops sub-sector. The construction and maintenance of public infrastructure and investment in research and extension activities are crucial elements of this mix, by raising labour productivity and incomes in tree crop industries. But the quality of these investments is paramount to exploit complementarity (see Chapters 7 and 8). Use of resources on unproductive investment is likely to have the opposite effect of crowding out private saving and investment.

6.2 Rural Credit Policy

6.2.1 How important are rural credit constraints?

Rural credit constraints are a constant theme in analyses of factors limiting the economic development of the tree crops sub-sector in Papua New Guinea. For example, Economic Insights (1998, p. 86) listed credit as a major constraint to smallholder development. DAL (1994, pp. 15, 39) commented on the important role of agricultural credit, and particularly an interest rate subsidy introduced in 1991, in improving the competitiveness of the tree crops sub-sector (although their observation lacks sound economic rationale and was not substantiated by empirical evidence).

Shaw (1985, p. 110), however, observed that although lack of credit is often blamed for constraining production, evidence is lacking that it actually is a binding constraint. Indeed, the empirical evidence on the importance of credit constraints to tree crop smallholders is patchy at best. Results of surveys yield mixed findings. In his survey of

economic determinants of coffee production, Overfield (1991b) found that a significant minority of smallholders claimed that their inability to purchase labour and inputs constrained coffee production. He attributed this constraint to a combination of low incomes and lack of access to credit. On the other hand, in its survey of Milne Bay coffee producers, the Institute of Marketing and Research (1992, p. 3) found that a mere five per cent identified credit as the major constraint they faced.

Shaw (1985, pp. 110–111) stressed the need for credit to be effectively used, a theme taken up by others. Complaints regarding access to credit could have more to do with technical know-how and financial viability. Kuimbakul and Gilling (1989) reported that coffee estates gain access to credit provided projects are viable, while coffee smallholders might well be constrained by their inconsistency in application of simple field husbandry techniques, not credit availability. The World Bank (1992, p. 21) observed that the bias in lending mainly to estates arises partly from a low demand for credit by smallholders. Economic Insights (1998, p. 105) summed up the situation succinctly, observing that:

> *To a large extent the financial constraint on small businesses is not so much a failure of the market but a reflection of the dearth of bankable projects. However, the financial sector is an area where market failure problems frequently exist and most of these failures are related to informational problems.*

6.2.2 Role of the Rural Development Bank

Smallholder focus

Rural credit policies in Papua New Guinea have mainly involved the subsidisation of loans to small farmers and the establishment of lending programs and credit guarantee schemes. This has taken place through RDB, the state-owned PNG Banking Corporation and commercial banks. Traditionally, RDB provided unsupported guarantees to village smallholders, where only an extension officer from DAL was required to assess the capacity of the guarantors to meet the guarantee. The extension officer was also responsible for ensuring that loans were repaid on time. Costs of lending inevitably increased once RDB began using its own extension workers (Jarrett and Anderson 1989).

RDB was mandated in 1985 to ensure that 75 per cent of its portfolio was invested in agricultural credit, but this figure was never seriously in contention. Loan disbursements to agriculture peaked at 58 per cent in 1987. By 1989, the proportion of loan value approved to agriculture, forestry and fisheries had already

declined to 38 per cent, then to 33 per cent by the first three quarters of 1996 (BPNG 1998, p. S20). Although attempts have been made to reach the smallholders in the tree crops sub-sector, rural credit policies have traditionally concentrated on the less risky estates producing coffee, cocoa and palm oil. RDB and commercial banks favour loans to estates, which use the credit to purchase most of the production inputs used in the tree crops sub-sector, over smallholders at whom subsidised credit schemes are targeted (Gumoi 1994).

Estimates suggest that 60 per cent to 70 per cent of agricultural loans made by RDB are to producers in the estate sector (World Bank 1992). Admittedly, smallholder demand for credit is relatively low given their limited use of purchased inputs and low levels of investment. Moreover, with declines in the total supply of institutional credit to agriculture, in line with declines in world prices for export tree crops until recently, it has been difficult to promote smallholder credit schemes.

Lending to smallholders has been predominantly short-term, constrained by land tenure arrangements and availability of collateral. Efforts have been made by RDB (and its predecessor, the Agriculture Bank of PNG) to provide long-term credit in order to develop customary land. First, lease-lease back arrangements were used to attempt to secure titles through a government lease that had then been leased back to the corporate body formed by the landowners (Jarrett 1990). Second, the Clan Usage Agreement (1967) provided security for banks that received a guarantee on the loan from clan leaders, who accepted that no further loans would be made available to the clan if default occurred (Jarrett and Anderson 1989).

Problems in delivery of financial services

After several years of sustained losses, the portfolio of the Agriculture Bank of PNG was taken over by the PNG Banking Corporation in 1993 (Kannapiran 1995, p. 6). By early 1994, the bank was re-established as RDB and the national government injected K10 m of capital (Economic Insights 1994). After a decade of dismal performance, RDB began to undertake reforms and improve its operations (Economic Insights 1998, p. 101). In particular, it had begun to act more as an agent in the implementation of projects, particularly in 'assistance in managing a microcredit scheme using government extension offices and industry corporations' (Economic Insights 1998, p. 104). Despite these improvements, RDB was recently merged with the PNG Banking Corporation[50] following a review to test its viability as an independent and commercial bank. By 1996, accumulated losses had reached K68 million (Economic Insights 1996, p. 87).

6.2.3 Commercial credit to the rural sector

The commercial banks provide more institutional finance to the rural sector than RDB. In the past, they have had certain requirements placed on them to provide concessional interest rates on short-term agricultural loans, even with no collateral. This policy inevitably decreased the overall availability of funds for agricultural loans because banks had to increase rates to other borrowers or decrease interest rates on deposits.

Nearly 95 per cent of agricultural credit supplied by commercial banks has gone to producers in the estate sector (World Bank 1992). Most loans have been to coffee and cocoa producers.

An attempt was made to decrease uncertainty of insecure land titles with the introduction of the Credit Guarantee Loan Scheme in 1977. The Scheme was introduced by the PNG Banking Corporation and involved commercial banks. In the agricultural sector, the PNG Banking Corporation has been the intermediary for governments, providing an 80 per cent credit guarantee (Economic Insights 1994). The scheme is restricted to national organisations and has been successful in providing credit to many otherwise ineligible enterprises (Jarrett and Anderson 1989). But this has only had a minor impact in removing the rigidities surrounding land rights and credit provision. According to Mawuli and Yala (1995, p. 63), the Scheme faded in importance in the late 1980s, handicapped by high default rates. Such a type of scheme, they concluded, is always problematic.

6.2.4 Performance of rural credit institutions

Factors causing inadequate credit services to smallholders

A number of factors have caused the failure of RDB and other financial institutions to satisfy the needs of smallholders:

- Inconsistencies exist between the goal of profitability and the social objectives that RDB is expected to meet (Duncan et al. 1995).
- Until recently, project appraisal and monitoring capabilities were particularly weak (Kannapiran 1995).
- The poor quality of service and management skills in RDB has impeded its performance as the 'monopoly lender' nature of the rural credit market has encouraged inefficiency. Kannapiran (1995, pp. 9–10) estimated that the total business per staff member in RDB was less than one-sixth that of a staff member in the PNG Banking Corporation, and operating costs for RDB were almost treble those for the PNG Banking Corporation.

- The market for financial capital is distorted in Papua New Guinea, reducing the availability of financial resources for smallholder agricultural production. In particular, doubts prevail over the efficiency and equity of credit subsidies. Initially, they were introduced to provide smallholders with better access to affordable credit because the 'riskiness' of agriculture ventures discouraged commercial banks from providing credit services to them. Subsidised interest rates have had a distortionary effect on factor use and impeded the balanced development of a rural financial system (Kannapiran 1995, p. 16). In any event, the subsidy element is usually 'too small to make the difference between a non-viable and viable project' (Shaw 1985, p. 111).
- Lack of effective collection efforts and sanctions for non-repayments led to high default rates for RDB. It promoted moral hazard whereby borrowers, aware that they were borrowing government money, felt less committed to repay the loan. This problem was compounded by the fact that RDB was not subject to any supervisory authority by the Bank of Papua New Guinea (Economic Insights 1994). Arrears were equivalent to 30 per cent of total assets by 1996 (Economic Insights 1996, p. 87).
- Weak commodity prices have reduced the profitability of agricultural producers at various times, most notably in the late 1980s and early 1990s. This is an exogenous factor that obviously cannot be blamed upon RDB and other financial institutions.
- RDB has had politicised lending decisions thrust upon it that compromise the commercial decisions made by its board, management and professional advisers (Kannapiran 1995, p. 27).
- Concentration on re-lending credit provided by international lending agencies, without developing deposit-taking functions, has contributed to wide fluctuations in the supply of agricultural credit (Economic Insights 1994).
- A cheap credit policy has created inequities by encouraging banks to allocate funds to the least costly and least risky customers, namely large borrowers with secure collateral. Smallholders have probably been made worse off, rather than better off, as a result (Jarrett and Anderson 1989). The uneven geographic distribution of the key agricultural industries also means that most loans at subsidised interest rates go to only a few provinces that are also the wealthiest.
- More efficient suppliers of credit, such as commercial banks, appear to have been crowded out in rural areas thereby lowering the overall levels of loans to, and deposits by, rural people.[51]

47 It is interesting to note that these increases in aggregate private saving occurred at a time of very low incomes for tree crop producers as a result of the recession in world commodity markets. There is therefore no evidence of dissaving by these producers during this period, although actions elsewhere in the economy may have concealed any dissaving that did take place.

48 An ordinary least squares regression equation of total saving on public saving was estimated using annual data from 1978 to 1992, reported by NCDS (1995). The estimated equation was: total saving = –41.25 –0.175* public saving. The t-ratio for the coefficient of the public saving variable is -1.418. Results show a weakly significant negative effect, rather than the expected positive effect. Regressing private saving on public saving yielded a strongly significant and negative relationship, with an elasticity of private saving to public saving at their respective means of –0.83. This indicates that public saving is almost wholly substituting for private saving, suggesting a substantial decline in private saving when public saving increases, and vice versa. But other factors influencing saving behaviour are not accounted for in this simple regression analysis, so not too much should be read into it. The result for the impact of public saving on private saving can be partly explained by a substantial increase in private saving as a proportion of GDP in the early 1990s. According to Duncan et al. 1995, p. 45), 'the private sector was called on to finance large budget deficits and make up for the shortfall in foreign financing of government transactions'.

49 Duncan et al. (1995, p. 84) noted that the depth of the financial sector in Papua New Guinea had increased little since the early post-independence period.

50 In turn, the national government is currently contemplating the sale of PNG Banking Corporation to the private sector.

51 For example, the Agriculture Bank of Papua New Guinea reduced its loans to the cocoa and coffee industries in 1982 and 1985 after prices fell, while the commercial banks expanded their lending during these periods (Jarrett and Anderson 1989). This suggests that banking services might expand in rural areas if RDB were to withdraw its concessional lending activities.

CHAPTER 7
AGRICULTURAL RESEARCH AND EXTENSION

Agricultural research and extension services could be included in the previous section on factor markets. But their importance to the long-term welfare of participants in the tree crops sub-sector, their peculiar nature as production inputs and their lack of markets mean they deserve separate treatment.

Agricultural research and extension activities in Papua New Guinea are described in sections 7.1 and 7.2, respectively. A discussion of the issue of funding and commercialisation of research and extension activities follows these descriptions in section 7.3. The policy issues of diversification and sustainability are especially important in the tree crops sub-sector. They are discussed in sections 7.4 and 7.5, respectively. To complete the chapter, past agricultural research and extension activities in Papua New Guinea are reviewed, and an assessment is made of their likely future importance to tree crops development.

7.1 Research Services

7.1.1 Delineation of research responsibilities

Research into tree crops is the responsibility of CCRI, the Coffee Research Institute (which is now merged into CIC) and the PNG Oil Palm Research Association. Their activities are briefly described in section 2.1. While it does not have a brief to carry out specialised research on tree crops, the National Agricultural Research Institute (NARI) is involved in tree crops-based farming systems to the extent that these systems involve food production. NARI began operations in early 1997, requiring a two-year transition period before it became fully functional. It has a governing body, the National Agricultural Research Council, comprising nine members from government, universities, smallholders and the chief executive of NARI (DAL 1996b, p. 7).

The industry organisations and non-government organisations tend to carry out specific crop research independently of government departments (Bakani 1994). But recent initiatives to set up farming systems programs for coffee-based and cocoa/coconut-based farming systems should at least partly reverse this tendency (DAL 1996a, p. 26). These initiatives should, in theory, entail collaborative work between the industry research bodies and NARI although little has emerged to date.

7.1.2 Public expenditure on agricultural research

Agriculture's share of total public expenditure decreased in real terms from 1980 to 1995, even though DAL and the provincial departments of primary industries (DPIs)

grew in size (DAL 1995b, p. 3). Research and extension services have suffered accordingly. In 1986–87, DAL spent K5.2 m per year on crop and livestock research and development. This was 0.5 per cent of the gross value of agricultural output, well below the 1 per cent average for developing countries in 1980 (Judd, Boyce and Evenson 1986). ISNAR (1982, p. 17) concluded from its study of agricultural research in Papua New Guinea that expenditure levels were far too low, and nothing has changed since that date to alter their finding. Jarrett and Anderson (1989) also contended that greater investment is needed in agricultural research, particularly in export crops in which Papua New Guinea has a comparative advantage. This, they observed, is likely to increase agricultural and national income in the long term.

The degree of underinvestment varies between crops. It can be approximately tested by comparing the research expenditure per dollar's worth of production of each crop. Jarrett and Anderson (1989) used agricultural export figures for Papua New Guinea to identify an underinvestment in research in coffee and coconut production. According to ISNAR (1982, p. 18),

> ... the net result of limited support is that the scientists' special skills [in agricultural research] are not being efficiently employed. While research program planning must be based on the senior research staff, the creative movers, financial planning should be based on realistic levels of support staff and operating costs.

The government recognised this situation in its 1986 National Development Plan. It proposed to increase the expenditure by DAL between 1986 and 1990 by more than threefold on coffee research and by a factor of 2.5 on cocoa and coconut research. These increases did not eventuate, partly because of the restructuring of agricultural research and partly because financial difficulties in the late 1980s and early 1990s in both the tree crops sub-sector and the general economy put an end to any attempt to increase funding.

7.2 Extension Services

7.2.1 Dual tracks to improve smallholder performance

Extension services offer dual tracks to improve the performance of tree crops-based farming systems operated by smallholders. The first is through the extension of knowledge of improved production techniques that shift the production function upwards. Second, extension officers can help smallholders achieve higher levels of technical efficiency for given technology use.

While most productivity gains are likely to result from improved technologies, the scope to improve the managerial skills of producers is not trivial. Variations in levels of technical efficiency among coffee and cocoa smallholders are quite substantial (Gimbol, Battese and Fleming 1995, Overfield and Fleming 1999), reflecting what could be achieved by technically inefficient farmers if they were to use 'best-practice' management methods (Fleming 1999e). Technical inefficiencies tend to be greater for recently introduced cash crops than for more traditional food production processes using simple, well-established and easily understood production techniques.[52]

7.2.2 Functions of DAL

DAL 'provides quarantine and plant protection services and conducts adaptive research ... introduces new crops, and provides export quality control for some commodities' (Grey 1993, p. 113). It has developed public investment projects (see section 8.1 below) with the specific aim of servicing farmers in remote areas. These projects include the Smallholders Market Access and Food Supply Project (DAL 1992), Marketed Fruit and Vegetable Programme, Tree Fruit Development Project (Food Management Division 1995) and a number of export crop projects (DAL 1995a, pp. 9–11). Public project funding is concentrated in the export crop sector, particularly oil palm, although the volume of allocated funds has been steadily decreasing.

Programs in the tree crops sub-sector have focused on expansion and rehabilitation, but funding shortages have restricted activities in recent years. Also, DAL transferred some of its functions to the industry organisations as part of restructuring in the mid-1980s. These functions included quality control, marketing, price stabilisation and crop-specific research. The restructuring enabled DAL to concentrate on data collection, food crops research and rationalising the extension services (Grey 1993). However, the links between government agencies and corporations are tenuous, and have long been strained between the national and provincial bodies serving agriculture (for example, Shaw 1985, p. 129).

In the 1990s, DAL began collecting farm-level economic data for use by planners, extension and agricultural research organisations. Progress in this endeavour has been limited by shortages of staff and funds in recent years.

7.2.3 Provincial agricultural institutions

Extension services were traditionally the responsibility of DAL, and the development of smallholder farming was brought about by simple improvements in production

that were disseminated through the didiman system.[53] Responsibilities for extension passed from DAL to the provincial DPIs with provincialisation in the early stages of adoption of the Organic Law in 1977.

Low levels of investment relative to the contribution by agriculture to the provincial economies have hampered the operations of the DPIs. At present, there are no extension workers to provide skills and basic inputs to farmers in some provinces. As a result, production levels and yields of many smallholder tree crops have been falling (Economic Insights 1994). The DPIs have also suffered from an exodus of expatriate extension workers, resulting in a depletion of the skills and knowledge base (Bakani 1994).

7.3 Funding and Commercialisation of Research and Extension Services

Key policy questions

There are three related policy questions about research and extension operations in the tree crops sub-sector in Papua New Guinea:

- Should they be privatised?
- If not privatised, should they be commercialised?
- Who should fund them, and should they be funded separately?

Privatisation

Privatisation of research and extension services is generally not considered an option by analysts. Kannapiran (1993), for example, assessed the privatisation option for agricultural research and extension in general and concluded that the weight of evidence did not favour such a move given the public good nature of much tree crops research. It is assumed that the existing organisational structures in the sub-sector will remain much as they are, with industry organisations retaining their current responsibility for research and extension.

Commercialisation

Misgivings about public sector performance in Papua New Guinea led the government to introduce a reform program of which commercialisation is a key part (Economic Insights 1998, pp. 83–84). As indicated in the previous section, these misgivings extend to research and extension performance in agriculture. Pressures have emerged to commercialise these services in order to make them more cost-effective.[54]

Funding

Past research and extension activities in the tree crops sub-sector have been funded by both government contributions and contributions from the industries through levies on producers. Public funding levels for the tree crop industries have fluctuated over the years. While this has been due, in part, to variations in levies caused by export price fluctuations, it has also been because the government has not yet settled on an appropriate financing strategy.

Within the tree crops sub-sector, the oil palm industry finances its own research activities through a levy on producers of K0.56/t of fresh fruit bunches delivered (Ellingson and Burnett 1998, p. 13), and has also received government financial support (Antony, Kauzi and Prior 1990, p. 2). The industry currently receives a subsidy of about K10 million towards research and development (Kannapiran 1999c). DAL has been involved in joint research in agronomy, entomology and smallholder farming systems through an Asian Development Bank loan facility (World Bank 1992, Annex 3, p. 1). Responsibility for research lies with the PNG Oil Palm Research Association. Extension to smallholders is the responsibility of the Oil Palm Industry Corporation (Ellingson and Burnett 1998, p. 3), which is funded by a levy on growers of K3.50/t of fresh fruit bunches (Ellingson and Burnett 1998, p. 13).

In the coffee industry, the PNG Coffee Industry Board levied an additional 2 toea/kg in 1985 to finance coffee research activities through the Coffee Research Institute and 10.0 toea/kg in 1986 to fund the extension arm of the Board, the Coffee Development Agency. The levy was reduced to 8 toea/kg in April 1988, with 2 toea to fund the operations of the Board, and 3 toea each to fund the activities of the Coffee Research Institute and the Coffee Development Agency (CIC 1994, p. 20). A further reduction occurred in 1989 when funding of extension ceased and 2 toea/kg was collected to fund research activities. Financial crises in the industry in the early 1990s meant the government stepped in to help finance these activities as part of the AGPS (CIC 1994, p. 20). The coffee industry currently receives a subsidy of about K10 million towards research and development (Kannapiran 1999c).

Cocoa research was transferred to the Cocoa Board from the public sector in 1986, since when it has been carried out by CCRI. Cocoa and coconut research activities of CCRI are jointly funded by the government, the Cocoa Board and the Copra Marketing Board. In 1992, the Cocoa Board was funded by a levy on growers of K37/t of which K19/t went to finance CCRI (World Bank 1992, Annex 4, p. 14). As at December 1999, the levy to fund CCRI was K20/t for cocoa producers and K4/tonne for copra producers. The government contribution to CCRI in 1999 was K1.093 m (Eric Omuru, CCRI, personal communication, 1999).

Overlapping responsibilities and initiatives have dogged the performance of extension services in the cocoa and coconut industries. Until 1997, agricultural extension was primarily the responsibility of the provincial governments through their DPIs. The national government has also been involved through specific programs such as the Smallholder Cocoa and Coconut Rehabilitation and Expansion Programme and the East New Britain Smallholder Development Programme (World Bank 1992, Annex 4, p. 14). The Cocoa Board also played a role through the Cocoa Quality Improvement Project (section 4.2.2). In 1997, the Cocoa and Coconut Extension Agency was established by the Cocoa Board and the Copra Marketing Board. Its establishment was an attempt to rationalise and improve the delivery of extension services to cocoa and coconut smallholders, with the 14 provincial DPIs providing ancillary support.

Arguments in support of some public funding

The precedents for a combination of government and industry financing of research and extension activities in the tree crops sub-sector raise the question of the best future course of action. At least five good arguments can be put forward to maintain public funding of at least a significant portion of the research and extension activities in the sub-sector:

- The public good argument remains relevant in that there are social benefits from the products of effective research and extension in the sub-sector that producers cannot capture for themselves.
- Agricultural research has strong potential to contribute to the national development goal of poverty alleviation (CIAT 1999), which is an important attribute given evidence of widespread poverty among households producing tree crops (Gibson and Rozelle 1998).
- The uncertain and often long-term payoffs of research and extension, particularly in the rural areas of Papua New Guinea where the private sector has not matured, discourage investment in these activities. This causes socially sub-optimal levels of investment.
- Strong theoretical and practical cases can be made for public funding of food research and extension activities. Given that tree crop smallholders typically are also heavily involved in food production, it is not possible to isolate their tree crop and food research and extension needs. Research work in intercropping (section 7.4) is a good example here.

- Any process innovation[55] in tree crop industries that lowers the unit cost of production is likely to yield secondary benefits elsewhere in the marketing system, create greater employment opportunities and increase government tax revenues (Jarrett 1985, p. 14).

In his comprehensive study of agricultural research and innovation in Papua New Guinea, Jarrett (1985, p. 15) reached the following conclusion:

> As a general statement one can say that for the export tree crops the gains from agricultural research and extension which result in process innovations will benefit both the industry and government and they should contribute towards the costs of such research and extension in the same proportion as they benefit. For the staple food items the bulk of direct benefits of such innovations accrue to consumers and such research should be largely funded from the public research.

It is difficult to make an exact apportionment of the benefits of research and extension involving tree crops. On balance, though, there is strong evidence for the continuation of joint funding of tree crops research and extension on an industry basis by the government and the industries themselves.

7.4 Research into the Diversification of Farming Activities

7.4.1 Prospects for diversification of tree crops-based farming systems in Papua New Guinea

Diversification as an attractive farm strategy

Diversification of the primary export base is a seemingly attractive policy option in the medium and long term. The government of Papua New Guinea has been trying for a long time to develop alternative crops such as spices, fruits, vegetables and nuts. At the micro level, diversification can also refer to the income source as well as the nature of crop production. In respect of agricultural income, diversification can broaden and strengthen the income base of farm households, given that they maintain a comparative advantage in their chosen crops, as discussed in section 2.4.1. Gibson (n.d.) provided a simple example of a diversified farming system producing coffee and honey. He demonstrated how such a system enables smallholders in the Highlands to earn higher and more stable incomes. Intercropping with perennial

crops can also reduce risks from natural calamities, enhance protection against pests and diseases, even out the demand for household labour over the year and achieve higher crop yields (Vandermeer 1990, p. 482). Perennial crops form a strong basis for risk management through farm-level diversification because of their greater certainty of yields relative to rain-fed annual crops in smallholder farming systems (Ruthenberg 1980, pp. 260-261).

Most producers of tree crop exports have already diversified their activities, and earn a large part of their income from food and livestock (section 3.7). But farm-based strategies for diversification have often been implemented at the expense of higher productivity through improved technologies. A preferred approach is to encourage farm-level diversification based on tree crops that encompasses improved farming practices and enables farmers to reduce risks while increasing net incomes. The effective dissemination of results from research work to smallholders would help them achieve these dual goals. In this way, further diversification could help sustain competitiveness and comparative advantage in smallholder farming systems based on tree crops. Intercropping offers a potentially powerful means to achieve this diversification.

Why has intercropping not been a more popular diversification strategy?

There is a longstanding debate on the value of diversification to smallholders that has led policy approaches in different directions.[56] This divergence of opinion on the merits of intercropping is partly a consequence of the complex relationships that influence the economics of the intercropping system (Burgess 1981). Developing country governments and donor organisations often forbid or restrict intercropping by smallholders because they assume that intercrops damage the principal crop. For example, the government of Papua New Guinea discouraged intercropping with coffee (Bourke 1985).

Godoy and Bennett (1991, p. 96) gave two reasons why development agencies and governments continue to encourage monocropping:

- Planners tend to focus their attention on maximising yields rather than smallholder incomes.
- There are incentives to develop a monoculture system because its agronomic performance is easier to monitor than that of a polyculture. This is the main institutional bias towards monoculture, rather than ignorance or doubt about the economic and agronomic advantages of intercropping.

Godoy and Bennett (1991, pp. 415–417) identified four factors that contribute to a lack of success among coffee diversification programs worldwide. These factors are present in Papua New Guinea for all tree crops:

- Marketing opportunities are limited for many potential substitute activities in production for coffee, with harmful implications for whole-farm profitability.
- Many diversification crops that have been promoted to reduce dependency on coffee in production have different ecological requirements, and therefore cannot replace coffee to any significant degree within an intercropping system.
- Some potential substitutes for coffee in production require processing facilities nearby. Their absence severely undermines the financial viability of their cultivation by smallholders.
- Diversification programs have failed because smallholders have faced numerous local agronomic and financial constraints in switching to more lucrative crops. These constraints include labour availability (sometimes relating to particular skills), suitable soils and climate, entry costs, and susceptibility to pests and diseases.

According to the World Bank (1984), Honduras and Guatemala explored the development of cocoa and cardamom, with limited success. Papua New Guinea also experienced limited success with cardamom in a coffee-based farming system in parts of the Highlands after early promise had been shown. Coffee had been a long-established cash crop in Karimui, for example, being first introduced into the area in the late 1960s. Cardamom was also introduced in the late 1960s. Smallholders began planting in 1972 and output had soon risen to between 7 tonnes and 10 tonnes per annum (Finlayson, McComb, Hardaker and Heywood 1991, p. 41). The Karimui Spice Company was established in 1978 to aid this development (Finlayson et al. 1991, pp. 41–43).[57] However, it collapsed in the late 1980s and, although people continue to grow some spices, it is done with little success. Pyrethrum is another cash crop that failed in the Highlands, due to its production in unsuitable physical environments, inadequate marketing arrangements, intensive labour requirements, relatively low returns and lack of conspicuous status as a crop (Howlett, Hide and Young 1976, pp. 234–235). The key message from these experiences is that considerable research is needed on crops introduced as part of a diversification strategy in tree crops-based farming systems. Marketing research is especially important because marketing problems have been at the core of most failures of cash crops introduced into tree crops-based farming systems. Yet it has proved difficult for public research bodies to undertake agricultural marketing research effectively (Fleming 1996).

McLaren (1999) also observed that a variety of constraints prevent the average smallholder from introducing crops with higher potential net annual returns into their tree crops-based farming systems. He listed these constraints as scarcity of suitable land, high entry costs and substantial supervision costs to prevent theft of high-value crops.58 Other difficulties pertaining to intercropping include competition for water, nutrients and light, should any of these be limiting, and mechanical damage due to cultivation, weeding and harvesting.

Godoy and Bennett (1991, pp. 87–94) conducted a survey on diversification within coconut production. Their results showed that designers of some projects allowed intercropping, although they restricted it to a leguminous cover crop in the same field. They referred to some important problems associated with intercropping (Godoy and Bennett 1991, p. 85). These problems included shading for some intercrops that delays the onset of the first flowering and the harvesting of the coconut, and damage to roots by intercropping too close to the principal crop. Intercropping of coconuts has long been condemned as retarding the development of the coconut palm (for example, Sampson 1923), prolonging the immature phase of the coconuts and reducing subsequent copra yields (McLaren 1999).

Research into diversification

Yudelman (1985) argued that the predisposition of governments and international agencies to discriminate against intercropping in agricultural development projects is a good reason to examine more closely its economic advantages. Research into intercropping in Papua New Guinea requires an inter-disciplinary approach, and close linkages between research and extension activities. It has mainly been carried out in the coffee-based and, to a lesser extent, cocoa and coconut-based farming systems by DAL.[59]

Intercropping trials in coffee-based farming systems offer insights into a potentially valuable alternative approach to smallholder diversification. McLaren (1999) described the progress made in field trials on intercropping with coffee, observing that experiments to date reflect the universal problem of shortages of resources and inadequate planning horizons. CRAC (1997), for example, reported some progress on intercropping trials involving coffee trees and various food crops. Unfortunately, no substantive conclusions have yet been reached from research work, despite indications that profitable options exist for intercropping as a means of diversifying sources of farm income.

In the opinion of Ruthenberg (1980, p. 256), there is an obvious trend in research towards monoculture in perennial crop production, for many reasons. Among the most important:

> ... yield-increasing innovations are best applied in pure stands [of tree crops], where they may be adapted to the special requirements of the crop. Mixed cropping is a handicap to mechanization also. We may assume therefore that mixed cropping is likely to decline.
>
> (Ruthenberg 1980, p. 318)

Agricultural planners have regarded the role of intercropping as largely concerned with risk reduction, and have seen such a system as limiting the introduction of improved techniques and higher productivity for the individual crops (McLaren 1999). Intercropping is more likely to be successful where harvesting and pruning are done using labour rather than machinery. This should favour its adoption in tree cropping in Papua New Guinea where very limited use is made of mechanised methods in production.

Despite the potential agronomic and economic advantages of intercropping, McLaren (1999) maintained that there has been limited scientific appraisal of intercropping, and even less economic appraisal. He attributed as the main reasons:

- the large demands made by intercropping trials with perennial tree crops on the scarce resources of land, skilled labour and capital
- difficulty in establishing adequate long-range research planning and financing processes that assure an appropriate conclusion to the trial work.

7.4.2 Linking diversification with improved farming practices

Linking diversification with improved technologies

With effective research and extension activities, considerable gains should be forthcoming to smallholders from successful research-based diversification. As noted in the previous section, most semi-subsistence producers of tree crop exports in Papua New Guinea have already diversified their activities. But past and current successes of farm-based strategies for diversification in tree crops-based farming systems in Papua New Guinea have been achieved largely at the expense of better farm performance through the adoption of improved technologies. As also noted in the previous section, the key to success of a policy for farm-level diversification that encompasses improved farming practices is to enable farmers to reduce risks while increasing net incomes. Evidence suggests this should be possible although the extent of gains would not be uniform between tree crop industries or farm households.

The goals of intercropping depend on the particular tree crop and the individual farmer's circumstances. They typically include a combination of objectives, such as maximising net farm income, maximising food production, reducing variability in food availability, and reducing income variability due to output and price fluctuations (for example, Overfield 1997). These goals would be achieved by establishing positive relationships between various crops in terms of economic factors, such as wages, input costs and output prices, and biological factors, such as limited competition for nutrients, light and water.

The coffee smallholding sector is one area in which potential appears to exist for income gains and reduced income variability. This potential could be realised, for example, by a combined approach of diversification through intercropping and the introduction of improved technology through rehabilitation practices. Better rehabilitation offers considerable potential to improve net farm incomes because methods are simple and well-tested, and hence easy to adopt, and increases in the yield capacity of older trees has a major positive influence on economic surplus (see section 7.6.1 below).

A case study in coffee intercropping in Papua New Guinea

A case study in coffee research was developed by McLaren (1999) to examine the potential economic impact of a research innovation in coffee production in a risky environment. McLaren (1999) undertook a stochastic financial analysis of a smallholder rehabilitation and fertiliser trial conducted by the Coffee Research Institute. In October 1986, the Coffee Research Institute established a fertiliser and rehabilitation trial in the coffee gardens of 20 smallholders in the eastern part of Eastern Highlands Province. The trial was conducted over a period of 12 years from 1986 to 1997.

The value of this research depends to a large extent on the ability of researchers to marry diversification through intercropping with technological advances that raise productivity and profitability in tree crop production while at the same time reducing income variability. Results of the stochastic analysis reported by McLaren (1999) offer grounds for optimism in this respect. Further research into intercropping with tree crops appears warranted.

McLaren's (1999) results also demonstrate the shortcoming of assessing the profitability of a tree crop in isolation from other crops in a tree crops-based farming system. The research roles of industry corporations would be more effectively undertaken with better knowledge of the competitiveness and comparative advantage of whole tree crops-based farming systems.

7.5 Agricultural Research and Sustainability

Exploitation of 'forest rent' in tree crop production

Ruthenberg (1980, p. 320) put forward sound reasons for potentially valuable contributions by perennial crops-based farming systems to the sustainability of agroecosystems. He contended that they:

> ... supply much productive employment, environmental amenities and security. They reduce leaching and erosion; they favour intercropping and multi-storey physiognomies that seem to be very efficient converters of solar energy into dry matter and usable products.

However, they cannot guarantee environmental stability. Much depends on the production methods applied. The trouble is that assessing the sustainability of tree crop farming systems in Papua New Guinea is difficult because of the relatively short period of observation of the development of such systems. In most instances, tree crop plantations are still on land cleared for its first cropping. Experiences of stress on systems from continuous use and multiple replantings are limited.

Ruf (1995) used the term 'forest rent' to explain the role natural forests have played in the development of cocoa industries worldwide. Much of his empirical evidence comes from West Africa, Southeast Asia and South America, but it has relevance to the development of the cocoa industry (and other tree crop industries) in Papua New Guinea. Ruf (1995, pp. 6–7) posited that the tropical forest contributes to cocoa development in two ways. The first way is through the typical location of the forest in an area of low population density: land rent is very low, allowing for lucrative exploitation of land resources in the years following land clearance. Second, the forest possesses a 'natural environment' rent that is made possible by its 'ecological setting which greatly facilitates cocoa planting from an agronomic point of view' (Ruf 1995, p. 6).

Ruf used the concept of Ricardian differential rent to explain the progression to further forest clearance for new cocoa plantations once the initial natural environment rent of the forest is exhausted:

> 'Forest rent' may be defined as the difference in cost between a tonne of cocoa produced on a plantation created after forest clearance and a tonne of cocoa produced by replanting on fallow land or after felling of the first plantation. The cost difference is directly related to ecological changes or reduction in the following agronomic benefits provided by the forest (weed control, soil fertility,

protection against erosion, moisture retention for soil and plants, protection against disease and pests, protection against drying winds, provision of food and miscellaneous forest resources, stabilizing effect on precipitation.

The 'differential rent' may vary with the level of technical progress and skill of cocoa farmers. 'Forest rent' exists because smallholders know how to use it.

(Ruf 1995, pp. 6–7)

For an empirical example, Ruf (1995, pp. 7–10) estimated labour costs on replanted cocoa in Côte d'Ivoire. He found them to be double those for newly planted stands of trees, due particularly to increased weed growth. He also found that the yields of replanted trees were much lower than those of trees planted after initial land clearance, and seedling losses became greater.

Increased stress on land from continuous replanting of tree crops

Ruf (1995) noted that cocoa booms are almost universally associated with monoculture after forest clearance and in advanced stages of the production cycle. He explained this phenomenon in terms of the ability of monocropping to exploit forest rent rapidly, but 'at the cost of permanently destroying such rent' (Ruf 1995, pp. 14–15).

Cocoa producers in Papua New Guinea will inexorably encounter differential rents with the mounting imperative to replant associated with rising aspirations, greater population pressure and a dwindling supply of land available for new plantings. The ability of smallholders to remain competitive in the face of declining yields, increasing costs and cultivation difficulties will depend in part on their management skills. But, increasingly, they will depend on research into plantation sustainability to enable them to prevent their production systems from degrading. Part of the research plan should be based on agroforestry and intercropping. Godoy and Bennett (1991, p. 94) used an example of a coconut-based farming system to show how intercropping can help to sustain a production system.

7.6 Contributions by Research and Extension to the Development of the Tree Crops Sub-sector

Research and extension functions in tree crop industries are argued by virtually all policy makers and observers to be an integral part of any long-term strategy to improve the competitiveness and sustainability of the tree crops sub-sector.

7.6.1 Research

Potential for research output to develop smallholder tree crops-based farming systems

Research is especially needed to develop appropriate technologies for the predominant producers, smallholders, to help alleviate their production constraints while simultaneously being consistent with their situation and circumstances. Bourke (1993, p. 31) identified low productivity as the major constraint to export crop development, implying that the scope for increasing economic welfare through productivity improvements is substantial.

Fleming (1999e) undertook simulation runs on the effects of increased productivity on economic surplus in each tree crop industry. He assumed separately a 10 per cent increase in annual harvest yields arising from an improvement in labour productivity, and a 10 per cent increase in the yield potential of all mature trees or palms. Results show that the harvesting yield increase generally has inelastic impacts on economic surplus across all industries. Elasticities are substantially higher, although still generally below unity, for the increase in the yields of mature trees and palms. The latter finding indicates the promising scope for increasing economic surplus in the tree crops sub-sector through the relatively low-cost research and extension work of rehabilitating older trees and palms.

Evidence of some research successes

Tree crop research institutes have focused on a wide range of research activities, such as improving yield potential and disease resistance of crop varieties. According to the World Bank (1992, p. 19), the tree crops research organisations 'are recognized to have performed generally satisfactorily, particularly the [PNG Oil Palm Research Association]'.

The few research evaluations undertaken reveal high estimates of returns on investment in tree crops research (Antony 1990, Antony and Parton 1991, Overfield and Kufinale 1993, p. 12). Recently, Kufinale (1994) reported favourably on the research work undertaken to introduce the rust-resistant catimor varieties of coffee trees in Papua New Guinea. These trees are capable of higher planting densities than hitherto used, with little or no adverse impact on tree yields (Gerard Stapleton, CIC, personal communication, 1999).

Criticisms of the performance of research institutes

Not all observations about research and extension have been so favourable, however. It is doubtful whether all research and extension functions performed by corporatised

tree crop organisations have led to improvements in the provision of services, and not all research endeavour has resulted in economic gains. CMB (1996, p. 22) reflected growing industry concerns when it expressed reservations about whether the copra industry received 'value for money' from the research activities of CCRI.

Wheeler (1982) noted that the thrust in coffee research work had been towards estates, in the expectation that any research benefits would flow down to smallholders. Overfield and Kufinale (1993, pp. 17–19) argued that research resources in the coffee industry, at least, need to be reallocated more in line with smallholder priorities, away from the traditional concentration on estates. The validity of their comment rests on the extent to which research activities for smallholdings and estates are complementary. The implication of the criticism by Overfield and Kufinale (1993) is that they are not. Harding, Bleeker and Freyne (1987, pp. 12–15) characterised the different research needs of the two modes of coffee production. Estates are high-input production systems while smallholdings are low-input systems, and the two systems require separate land evaluations and research programs. Many new management and cultivation methods emanating from research projects cannot be applied with equal success to the two systems, a view shared by the World Bank (1992, Annex 1, p. 20). The same probably applies in the other tree crop industries. In any event, Jarrett (1985, p. 95) commented that smallholders ignored recommendations based on estate-based research, and independently developed their own management practices.

Research processes and technical improvements need not be complex. For example, Shaw (1985, p. 51) cited findings by Newton (1985, p. 170) that the greatest constraint to coffee production among the Orakaiva was a shortage of coffee pulpers in working order. He also alluded to an observation by Etherington and Carrad (1984) that pruning was a simple improvement that could raise grower incomes, a process that apparently has still not been fully exploited (Gerard Stapleton, CIC, personal communication, 1998).

7.6.2 Extension

A long history of extension failure

The performance of extension services over the past 40 years has ranged from satisfactory to dismal. Most criticisms have been directed at the post-independence extension services in tree crop industries, and in agriculture more generally. It is interesting to note, however, that the didiman system was not immune from criticism either (Jarrett 1985, pp. 62–63). Early critical assessments were made of the

effectiveness of agricultural extension services by, among others, Howlett et al. (1976, p. 216), Harris and Williams (1980) and McKillop (1982). While the observations made by these authors are now around two decades old, little appears to have changed for the better and perceptions today reflect the same concerns.

Sitapai, Wayi and Ghodake (1994, p. 32) observed that many experienced expatriate staff migrated after independence. As a result, the quality and quantity of extension services fell. Remaining staff were forced to spread themselves over a broad range of duties (Stein 1991). Serious deficiencies became evident in the coffee industry with the 1986 outbreak of coffee leaf rust. The national and provincial governments were unable to mobilise resources quickly enough to counteract the spread of the disease.

Until the mid-1980s, very little published material was available on the role of extension officers, and on their interactions with researchers on the specific needs of tree crop smallholders. Provision of extension services to tree crop smallholders is difficult, but the pervasive criticisms of these services over two decades suggest that little headway has been made. Before 1976 they were condemned as inadequate, with Carrad (1982, p. 15) observing that the productivity of the young trees on most smallholder blocks offsets a 'lack of a viable extension service to smallholders'. Jarrett (1985, pp. 96-7) was gloomy about the prospects of smallholder extension services within provincial DPIs. He cited 'problems of literacy, geographical dispersement, small scale of operation which makes the cost of visits expensive', and a lack of relevance of research results to the management practices of smallholders. Bourke (1993, p. 35) also criticised the quality of extension services, and McConaghy (1985, p. 61) expressed concern about their decline in coffee-producing areas caused by provincialisation during the late 1970s and early 1980s. McKillop (1982) lamented an absence of clear objectives, good management and political commitment. Mitio (1990, p. 40) observed that the extension system had fallen behind in meeting the aspirations and the needs of farmers, with no account taken of changing circumstances and the availability of new and improved techniques. The dilemma of catering for the different extension needs of smallholders and estates has not yet been resolved, and only a long-term program to improve extension services is likely to yield results, according to Gillbanks (1992, p. 3).

Problems identified in extension

The World Bank (1988) outlined five main problems in extension:

- poor quality of staff due to lack of training and experience
- lack of knowledge, exacerbated by deficiencies in the level and transmission of research

- inadequate organisational structures
- poorly established supervision and management
- budget restrictions, resulting in lack of funding particularly to poorer provinces.

Economic Insights (1996, p. 87) added fragmentation of support services, which makes coordination difficult, fragmentation in lines of authority in the new provincial government system, and the centralised nature of DAL, with about 80 per cent of its staff based in Port Moresby.

7.6.3 Integration

It is difficult to assess the separate contributions made by research and extension to the development of smallholder farming systems based on tree crops. While ISNAR (1982, p. 22) accepted the above criticisms of the extension services, they also concurred with complaints made by the extension services in two respects. First, few technologies emanating from research have been applicable to the semi-subsistent tree crops-based farming systems of smallholders. Second, research findings were usually expressed in such a complex way that they were of little use to extension staff.

Sitapai, Wayi and Ghodake (1994, p. 32) recalled that adoption of the Organic Law in 1977 led to the devolution of extension services to the provinces while leaving research at the national level. As a result, the links between research and extension became more attenuated. The World Bank (1992) and Jarrett (1985, pp. 69–72) criticised the lack of integration of research and extension exemplified by the complaints about research activities made by the extension services. ISNAR (1982, pp. 22–23) commented on the need to forge better research–extension linkages and undertake more interdisciplinary research. Some attempts have been made in this direction through greater emphasis on farming systems research studies involving tree crops. Examples include studies of the cocoa- and coconut-based farming systems by Ghodake, Cook, Kurika, Ling, Moxon and Nevenimo (1995) and intercropping in coffee-based farming systems by Ghodake, Gaupu, Guman, Simin and Kanua (1995). But the impetus to undertake these exercises seems to have waned in recent years.

7.6.4 Sustainability

Kannapiran (1999c) contended that long-term competitiveness in the tree crops sub-sector depends heavily on enhanced productivity through technical change and increased technical efficiency. Sustained productivity gains, according to Kannapiran (1999c), are the key to meeting the challenges of commodity price variability and

declines in the terms of trade in the tree crops sub-sector. Yet the effects of intensification on sustainability are of special concern.

Allen (1993) gave a good account of the ecology and evolution of agricultural systems in Papua New Guinea. He noted that any 'intensifying agriculture system in which technical innovation is inadequate may exhibit observable symptoms of stress' (Allen 1993, p. 3). In the words of Allen, Bourke and Hide (1995, p. 297), intensification 'brings about changes that must be overcome by innovation ... intensification without innovation is likely to lead to land degradation'. These observations on intensification, innovation and stress suggest that there is a major research and extension effort needed in future to monitor the sustainability of tree crop farming systems. Allen (1993, pp. 12–20) emphasised, among other matters, the continuing need to collect information on agricultural systems. He also considered it imperative to involve rural people in efforts to achieve sustainable agriculture, particularly women who, he noted, are disadvantaged in all aspects of rural life and would almost certainly suffer disproportionately from degradation of farming systems.

---

52 For instance, Overfield and Fleming (2000) estimated a mean technical efficiency index of 0.57 in coffee production for a sample of coffee smallholders in Eastern Highlands Province. For the same sample of households, the comparable estimate of mean technical efficiency in food production was 37 per cent higher, at 0.78.

53 The didiman system of district-level provision of government services to rural villagers was introduced during colonial times.

54 Commercialisation is taken here to mean placing research and extension on a fee-for service basis.

55 That is, new ways of producing outputs.

56 The following summary of this debate is taken from McLaren (1999).

57 Chillies were also grown as a minor cash crop during this period, although price fluctuations and inadequate marketing arrangements hampered their development (Finlayson et al. 1991, p. 40).

58 Indeed, coffee itself suffers from theft in Papua New Guinea (see section 8.6.2).

59 Responsibility now rests with NARI.

CHAPTER 8
PUBLIC INVESTMENT POLICIES AND PROGRAMS

The chapter begins with a discussion of public investment in agricultural development planning. This introductory section is followed by an assessment of the importance of rural infrastructure, particularly transport, to the development of agriculture, in general, and the tree crops sub-sector, in particular. In section 8.3, the policy focus shifts to freight subsidies as a means to encourage increased production of tree crops in remote areas. Rural education, rural health and nutrition, and law and order are appraised as public policy options in final three sections of the chapter.

8.1 Public Investment in Planning Tree Crops Development

Potential for widespread benefits of rural public investment

Most rural households in Papua New Guinea are involved to varying degrees in the production of tree crops (section 1.4). Hence, policies influencing the investment in public goods in rural areas can influence production and profitability in the tree crops sub-sector at all levels from the producer to the point of export.

Public investment policies and programs have greater potential than pricing policies to increase incomes of producers selling in export markets on a sustainable basis. They do this by reducing the long-run costs and improving the efficiency of agricultural operations. They also complement the free-trade policy embedded in the current structural adjustment program by lessening distortions in the domestic economy. Efficiency here can be of different types—allocative, technical, size and technological—and in different parts of the tree crop industries—production, domestic buying, processing and exporting.

Key elements of development planning and implementation

The key elements of development planning and implementation in Papua New Guinea are the medium-term development strategy and the public investment program. The medium-term development strategy is relatively new, commencing in 1996. It is a five-year rolling strategy that defines priorities in government expenditure (Economic Insights 1998, p. 55). The public investment program, instituted in 1988, also highlights development priorities through a list of 'projects and programs to be funded outside the normal recurrent budget' (Economic Insights 1998, p. 55). The only significant change to its operation has been the devolution to

the provinces of greater responsibility for selecting and implementing projects and programs. The public investment program is used to assess specific projects according to the priorities set in the medium-term development strategy (Economic Insights 1998, p. 60).

Decline in public investment in agriculture

The government invests money in agriculture through DAL, provincial DPIs, statutory agencies and financial intermediaries. Direct public agricultural investment has declined over the past 15 years. Instead, the government has increased its support for agriculture through the promotion of privatisation and corporatisation (Duncan et al. 1995). Agriculture's share of government expenditure had declined to a mere 3.7 per cent by 1998, of which 2.2 per cent was for recurrent expenditure and a paltry 1.5 per cent for development expenditure (Economic Insights 1998, p. 57). Two major problems have arisen as a result. First, the government tends to support the private sector for less viable projects, where the private sector is willing. Second, the support comes from open-ended subsidies that run counter to fiscal policy.

A decline in the allocation to general infrastructure expenditure has been of equal concern to agricultural participants in the economy. In 1986, the proportion of national government expenditure on infrastructure was 19 per cent of total non-debt expenditure (Stein 1991, p. 71). The 1998 estimate was 10 per cent of which only 1.7 per cent was on recurrent expenditure (Economic Insights 1998, p. 57).[60] Admittedly, some of the decline would be offset by the increased allocation of funds to the provincial governments (up from 18 per cent to 30 per cent over the same period). But it is unlikely to change the picture significantly because of the mostly poor record of the provincial governments in infrastructure expenditure.

Concern about a lack of public funds being invested in agriculture is deepened by the poor quality of much government expenditure. Economic Insights (1998, pp. 58–59) cast doubt on the potential for public investment programs to generate social and economic development:

> A major problem with the planning and budgeting process is the limited capacity of the Government to implement its plans and public investments and to effectively monitor implementation. This is an even more serious problem at the provincial level. ... Reasons for the poor implementation record include a serious lack of project implementation skills, inadequate accounting systems and different systems and processes imposed by different donors, which create additional administrative burdens.

Unfulfilled plan for an agricultural investment corporation

The national government has been receiving an increased flow of revenue from the exploitation of mineral and energy resources (Duncan et al. 1995, Ch. 5). It recently assessed the potential to use some of these funds for major public and private investment in agriculture to achieve development goals, in response to the decline in agricultural investment throughout the 1980s. A plan was considered to establish an agricultural investment corporation (DAL 1994, p. 28) that would have provided equity finance for investments in agricultural production, marketing and processing. Although such forms of public investment do have the ability to improve the profitability of agriculture, governments have a poor record in commercial activity (Economic Insights 1994). It was suggested that the private sector provide most of the equity finance, but the financial crisis in the mid-1990s put paid to these plans and the corporation was not established.

8.2 Potential Contribution by Rural Infrastructure to Economic Development

8.2.1 General impact on rural development

Many rural areas in Papua New Guinea are separated from urban areas and other rural areas by wide and fast-flowing rivers, long and wide stretches of swampy plains, dense forests and rugged terrain (Yala et al. 1999). It is not surprising, therefore, that it is expensive to provide and maintain economic infrastructure for rural activities. Transport and handling costs are high to extremely high, acting as a major constraint on economic integration. The road network is very limited, and most rural communities either remain isolated or face varying degrees of market inaccessibility. The development of rural infrastructure offers the prospect of increasing agricultural marketed surplus by reducing marketing costs for commercial products such as tree crop outputs and opening up market access where none existed previously.

Yala et al. (1999) cited two examples to illustrate the impact that road transport infrastructure has had in Papua New Guinea. First, the World Bank (1980) reported that the growth of the oil palm industry in the West Nakanai region of West New Britain Province was a direct result of the construction of a road and wharf in Kimbe, the provincial headquarters. These developments permitted the expansion of copra, oil palm and other export crop production. The second example is the rapid expansion of coffee production in the Highlands provinces of Papua New Guinea. This expansion was a direct consequence of the construction of the Okuk Highway,

linking all the Highlands provinces to the major port at Lae. General rural development followed the expansion of economic activities associated with these industries.

Yala et al. (1999) concluded from their studies of accessibility in coffee- and oil palm-growing areas in Papua New Guinea that road transport infrastructure is an important factor in the development of the tree crops sub-sector, and in rural and general economic development. The construction and improvement of rural transport infrastructure reduce transport costs and therefore marketing costs. They also provide market access where none previously existed. The result is higher producer prices that increase the marketed surplus of tree crops produced by smallholders, with positive consequences for economic, agricultural and social development in rural areas. Hence, public commitment to both the construction and continued maintenance of road infrastructure offers attractive benefits.

Fleming (1999e) tested the impact on economic surplus in each tree crop industry of an improvement in marketing that leads to a fall in marketing margins. Results reveal positive elasticities of economic surplus in response to a reduction in marketing margins that are in the moderate but inelastic range.[61] The exceptions are coffee estates and smallholders where the elasticities are high, reflecting the considerable costs of transfer of green beans from the factories to the point of export. Elasticities tend to be higher for estates than for smallholders, with the exception of palm oil. Oil palm smallholders tend to have higher freight costs because they are located further from the mills than are the estates.[62] The elasticities for coffee, cocoa and copra would be significantly higher (and probably different between estates and smallholders) had it been possible for Fleming (1999e) to incorporate reductions in the marketing margins between the factory or depot and the farm gate.[63] No strong relationship is discernible between the elasticities according to different assumptions about product price trends.

8.2.2 Transport infrastructure and general agricultural development

Uneven distribution of impacts of transport infrastructure

Past extensions to the transport system have been a major stimulus to agricultural growth in Papua New Guinea. But the benefits have been unevenly spread, with some areas faring better than others (Shaw 1985, p. 105).

Persistence of high transport costs

Improved transport links in Papua New Guinea have increased tree crops supply, and also increased the number of people growing tree crops. Yet, transport costs

have remained high despite these improvements, stifling further increases in the volume of cash crops marketed and also constraining staple food output and thereby reducing the level of national food self-sufficiency (Shaw 1985, p. 105, Jarrett and Anderson 1989). The greater the bulk relative to value and perishability of output, the greater the impact of high transport costs and unreliable transport services on agriculture. The impact has been greatest when food prices have decreased and lessened the attraction to farmers producing for cash sale those crops with low value–weight ratios and high perishability. In these respects, tree crop products have fared rather better than food products.

Inconclusive evidence on the need for more transport construction

Chronically high transport costs and unreliable transport services have led observers to claim that transport investment, currently a provincial responsibility, is well below its socially optimal level. The result is a limited road network that hinders agricultural progress. Yet, discussing the road situation in Papua New Guinea, Stein (1991, p. 40) claimed that:

> ... there are in fact very few economically viable roads still to be built. Cost-benefit analyses suggest that funds would be better spent on upgrading and maintaining the existing road network than building new roads.

While this assertion has a ring of truth about it, and is backed up by anecdotal evidence, Stein does not provide any comprehensive empirical evidence to support his statement. Given the difficulties involved in getting accurate measures of the values of social benefits and costs of individual roads, the first part of his statement should be treated with caution.

More generally, the extent to which rural infrastructure, such as roads, water, electricity, communications and marketing structures, helps to create a profitable agricultural export sector is difficult to assess because of a lack of economic studies of the impact of investment in rural infrastructure and marketing facilities.[64] Nevertheless, some empirical evidence exists. It is summarised in the next section, with emphasis on the tree crops sub-sector.

8.2.3 Impact of rural infrastructure on the development of the tree crops sub-sector in Papua New Guinea

Impact on accessibility to markets

There are some survey data that point to major constraints placed on tree crop production by lack of accessibility by producers to input and output markets. In his

analysis of the cocoa and copra marketing, Livingstone (1989, p. 128) identified transport problems as the second most binding constraint on smallholders, and found a positive supply response to improved market access.

According to the results of survey work undertaken by Overfield (1991b) and Overfield and Irog (1992), growers regard transport and market access as the economic determinants of smallholder coffee production of most concern after coffee price (which, in turn, these factors influence at the farm gate). Their results showed that poorer and more remote growers have to sell further back in the marketing chain and receive lower prices. Kuimbakul and Gilling (1989) reported similar findings, observing that the unavailability of transport adversely affects the way smallholders sell their coffee. The Institute of Marketing and Research (1992) surveyed villagers in Milne Bay Province, and found transport was a key concern of producers who want to grow more cash crops. These producers viewed both road access and sea transport as the major constraints they faced. Results of surveys of 100 smallholders in East New Britain by CCRI, currently being analysed, show that price and accessibility to transport ranked first and fifth in importance as factors influencing cocoa output, and first and fourth in importance as factors influencing copra output (Omuru, Nailina and Fleming 2001).

Accessibility is exacerbated by lack of maintenance and rehabilitation of infrastructure

The national government recognises the importance to agricultural development of road transport infrastructure and its maintenance, as is evident from the White Paper on Transport. It stated in the White Paper that one of the main needs is to provide farmers 'with access to production site and markets and to lower the present high transport costs' (Department of Transport 1992, p. 8). Periodic maintenance and rehabilitation of roads offer a means of 'locking in' the benefits of an expanding transport network. On the other hand, a poorly constructed, maintained and rehabilitated road transport system is almost as bad as having no road at all (Yala et al. 1999).

Effective capital works programs have varied between provincial and local administrations (for example, Lea and Crittenden 1988, p. 17). Nevertheless, much of the network of roads and other economic infrastructure in Papua New Guinea is poorly constructed and suffers from a lack of maintenance. Gani (1997) provided statistical evidence that poor quality and inadequate maintenance of public investment prevent physical capital accumulation from contributing to economic growth in Papua New Guinea. As a result, most rural communities continue to face varying degrees of market inaccessibility.

Two examples of lack of maintenance and rehabilitation of roads were mentioned by Yala et al. (1999) by way of illustration. First, Macrae and Vele (1981) found that access to coffee blocks in the western part of Southern Highlands Province was exceedingly difficult in large part because vehicles could average only 15 kilometres per hour. Very high depreciation rates on motor vehicles made it difficult to keep transport costs to affordable levels. Feeder roads to the blocks were very poorly maintained while some blocks remained isolated. On a broader scale, much the same is true of the major national highways. Both producers and consumers in the Highlands face high transportation and handling costs due to the poor state of the Highlands Highway. Producers receive low farm-gate prices from the commercial sale of crops. Consumers pay high prices on all consumables, especially those that have a high transport input.

Yala et al. (1999) found that the maintenance and rehabilitation of existing roads was inadequate in certain areas producing coffee and palm oil. They asserted that various levels of government are guilty in not taking seriously their responsibilities to maintain and rehabilitate roads.

The World Bank (1997, p. 4) summarised the current status of roads in Papua New Guinea, where:

> ... more than 85 percent of main roads and most feeder roads are earth-surfaced, poorly maintained, and inaccessible/impassable during and after rains. All-weather road links are also often disrupted because of poor maintenance, particularly of the bridges and culverts.

Influence of rural infrastructure on marketing patterns and performance

In his study of selected areas in Western Highlands Province, Temon (1990) found that prices paid at the farm gate to coffee smallholders differed significantly according to market accessibility. Similar findings were reached by Yala et al. (1999) in their study of various sites of smallholder coffee production in Eastern Highlands Province and Chimbu Province.

Bodman (1989) found evidence of inter-provincial movement of coffee in Papua New Guinea that was influenced by access to transport facilities, especially roads. For instance, coffee was transported out of Enga Province where there was no processing facility. Yala et al. (1999) confirmed Bodman's (1989) findings. They reported instances of coffee being brought to factories in Kainantu from Okapa, Goroka and areas in Western Highlands Province, even though there are processing facilities in those areas, because of relatively good access to roads.

Livingstone (1989) chronicled transport deficiencies in cocoa and copra marketing. He identified an absence of bulk-building[65] and the movement of very small consignments over even very small distances. High transport charges were made for off-shore islands, yet overland costs were high relative to those by sea from established ports that had good transport connections. Substantially negative net grower prices were estimated for 'locations away from the developed north-east portion of the Gazelle'. Major costs were incurred by growers in East Sepik and West Sepik through the spoilage or loss of cocoa beans imposed by transport deficiencies (Livingstone 1989, p. 128–129).

Potential for improving strategies to manage risk

Transport and communications infrastructure that improves accessibility of smallholders to markets can improve the ability of smallholder households to manage risk (see section 3.7). It enhances this ability by introducing the households to a wider range of options in economic activity. This includes the option to diversify sources of cash income away from agriculture-based activities. It also improves access to financial services (Duncan et al. 1995, p. 91).

Suggestions to improve accessibility

Yala et al. (1999) made the following four suggestions to improve market accessibility in areas growing tree crops. First, governments at all levels should give a higher priority to the maintenance and rehabilitation of existing roads. New road constructions should only be undertaken after establishing sources of funding for periodic maintenance and rehabilitation, and following adequate economic analysis. Second, estates, smallholder grower associations and industry organisations should establish understandings with the national, provincial and local levels of government and the works department on a schedule for the periodic maintenance and rehabilitation of road networks used to transport tree crop output. Third, the transport component of the pricing formulae of marketers of tree crops should incorporate distance, status of road and other relevant factors, and the collection of tree crop output should be made more competitive.[66] Finally, the nucleus estate system of farming offers some advantages in improving accessibility for oil palm smallholders, and should be examined for other tree crops.

8.2.4 Locking in budgetary allocations to the operation, maintenance and rehabilitation of rural infrastructure

Ensuring adequate public funds in times of financial stringency

The current financial crisis in Papua New Guinea suggests there is a potential problem with allocating sufficient public funds to operate, maintain and rehabilitate

rural infrastructure. However, Chand and Stewart (1997, pp. 66-67) did not foresee a contradiction between the need for economic reform and limits on public expenditure and infrastructure improvement:

> *There is ... considerable scope for public expenditure efficiencies to be achieved through additional maintenance and rehabilitation expenditure being provided for existing public infrastructure assets and services. ... A preoccupation with low budget deficits ... may be counterproductive. The structure of the budget may be just as important as the level of the deficit per se. Investments in areas with rates of social return greater than the interest rate and financed from resource rents could raise welfare and the rate of economic growth.*

Examples abound of the scope to rationalise major investments and the delivery of services that are of particular concern to rural infrastructure and its use. They include the prevention of duplication in construction and maintenance, and the breaking up of construction projects into small and uneconomic parcels (Leechor 1995, p. 37).

On the issue of budgetary allocations to road maintenance, Leechor (1995, p. 36) considered the problem not simply as one of the amount of funds. He was more concerned that the money has not been getting to what he termed the 'front-line service level'. Furthermore, community participation in the provision of local services has been declining over the past 20 years. He also alluded to the equity dimension, that relatively poor provinces tend to get too little money to meet their greater needs (Leechor 1995, p. 35).

Addressing shortfalls in financing recurrent costs

In a very good overview of the problems of recurrent cost financing, Mellor (1998, pp. 142–143) identified three broad ways to address the issue of shortfalls in the financing of recurrent costs of operating and maintaining public assets such as transport infrastructure. They are overcoming financial shortfalls, institutional arrangements to address shortfalls and technical measures. The four pertinent measures that Mellor listed to overcome financial shortfalls are tax increases, international donor contributions to the recurrent budget, designing the contributions by international donors to the development budget to 'capitalise' traditional operation and maintenance expenditures,[67] and a reallocation of budget priorities from capital expenditure to operation and maintenance expenditure.

On the matter of institutional arrangements, Mellor (1998, p. 142) again identified four possible initiatives. The first is to improve cash flow management 'to strengthen

the planning capacity of agencies'. Second, as noted above, institutional overlaps need to be minimised for operation and maintenance activities. The third and fourth approaches are to dedicate financial resources in key sectors and develop 'user pays' arrangements (see below).

Three technical considerations mentioned by Mellor (1998, pp. 142–143) are to improve techniques used in planning technical maintenance, design investments to minimise future operation and maintenance requirements, and build maintenance arrangements into capital expenditures.

An innovative way to solve road funding problems

Gwilliam and Shalizi (1999) identified dedicated road funds involving active participation by the local populace as a significant way forward in funding road maintenance and rehabilitation. They made the following observation in respect of developing countries in general, but it is especially pertinent to the situation in Papua New Guinea:

> Insufficient or uncertain budgetary allocations to road maintenance have resulted in road deterioration that has significantly increased production and transport costs in many countries. To avoid this problem, highway professionals advocate the establishment of dedicated road funds, managed by independent road boards made up of user representatives. The road boards would have the power to determine both the level of charges for road use and the level of expenditure on road maintenance. By contrast, macroeconomists and public finance specialists have tended to resist the establishment of dedicated road funds. They argue that road funds reduce fiscal flexibility, do not adequately address problems associated with the provision of public goods or the internalization of externalities, and often are not well managed.
>
> In general, there are two long-term institutional options for reconciling fiscal prudence with asset maintenance: a road agency that is operated commercially (subject to the normal oversight of behavior accorded to privatized monopolies), or a reformed and well-functioning budget process. ... road funds must be viewed as a provisional, case-specific intermediate step in the direction of one of the long-term solutions.
>
> (Gwilliam and Shalizi 1999, p. 159)

8.3 Freight Subsidies

Subsidising freight for the transport of tree crops is an option worth considering, especially for remote producers or those served by a poor road network. However, it should only be a short- to medium-term option, pending improvement in the standards of transport infrastructure.

CIC (1992) recommended freight subsidies as a social and economic measure to alleviate the plight of remote smallholders who produce coffee. DAL (1995a, p. 17) flagged the introduction of a freight subsidy scheme to help producers in remote regions that are not accessible by road. Planning reached an advanced stage, but the financial crisis of the mid-1990s meant that the scheme has not yet been implemented. There are past examples of freight subsidies provided to specific groups of farmers producing tree crops. For instance, oil palm smallholders have received subsidised transport costs from the farm gate to the mills at Bialla (DAL 1995a, p. 18). The concern in this section, however, is with more general freight subsidies to farmers in remote areas.

While such a scheme might have spatial equity attractions and could increase agricultural output, it might cause some efficiency losses. The extent of these efficiency losses depends in the main on the opportunity cost of encouraging producers to remain as agricultural producers. If this cost is very low, as might well be the case where people in remote villages have no alternative productive activity to agricultural pursuits, the extent of the efficiency losses may be easily outweighed by the gains in output and welfare induced by the subsidy. Alternatively, the funds spent on freight subsidies to remote producers might have been more efficiently spent on less remote agricultural producers.

Fleming (1999e) tested the impact on economic surplus in each tree crop industry of a freight subsidy policy in which the government pays a subsidy that amounts to 10 per cent of the marketing margin, using budget funds.[68] Freight subsidies have positive but low elasticities of economic surplus, on average. The exception is for cocoa smallholders where the elasticity is negative and low. Elasticities are very low for coffee and palm oil and higher for copra. No pattern is observable across products according to trends in the product price. They increase quite sharply, however, when the fixed portion of the marketing margins is increased (used as a proxy for greater remoteness). These results only pick up the effects of a subsidy between the factory or depot and the point of export (except for palm oil). If it had been possible to include its effects between the farm gate and the factory or depot, it is suspected that the positive impacts would have been significantly greater.

8.4 Rural Education and Training

8.4.1 Influence of education on productivity

In a survey of the private sector in Papua New Guinea in 1993, INA (1994) identified lack of skills as a major constraint to economic development. This constraint is as binding on development in agricultural industries, including the tree crop industries, as in other parts of the private sector. In a specific case study involving tree crop production, Overfield and Fleming (1999) found that the level of education of the male head of household positively and significantly influences technical efficiency in smallholder coffee production.

Relevant education and training is needed at all levels, from production to export, to provide the skilled labour needed for tree crop exports. At the farm level, few smallholders in the tree crop industries have so far adopted improved technologies to increase total factor productivity, but they can be expected to rely more heavily on such technologies over time to maintain international competitiveness (section 2.4.2). In this case, education and training will become increasingly important to enable them to be familiar with the optimal levels of usage of technical inputs such as fertilisers, herbicides, pesticides and mechanical inputs.

Educating the farming population will increase the benefits from agricultural technologies. Hence, returns from increased investment in rural education would improve as agricultural research expands. According to Jarrett and Anderson (1989), investment reallocation into rural education is also required to enhance the capacity of farmers to respond to market conditions and move out of agriculture, as well as improve their skills to adjust to changes in technologies.

Extension workers have often acted as adult education teachers in the rural areas. This approach could be more beneficial to the rural areas than a top-down approach where information links are weak (Jarrett and Anderson 1989). At the export level, for example, the Cocoa Board (1997, p. 16) identified a 'need for extensive training for our exporters, in international trade, both physical and futures markets and risk management tools and strategies'. One positive outcome that they expected from such training would be greater competition among exporters, to alleviate the current situation of a near monopoly in cocoa exporting.

8.4.2 Recent performance in public education

Public education expenditure as a percentage of national income in Papua New Guinea in the late 1980s was more than double that of many other developing countries, having grown to 20 per cent from 13 per cent at independence (Jarrett and Anderson 1989, p. 95). Despite this expenditure, 'educational achievements remain low by international standards' (Economic Insights 1998, p. 107). This situation is likely to continue well into the future because of the high cost of public education, internal inefficiency in its provision and difficulty in attracting good teachers (Economic Insights 1998, p. 109), and an unbalanced allocation of resources within the education sector.

In respect of the last point, Papua New Guinea devotes a relatively high proportion of its resources to secondary and tertiary education, where the social rate of return is lower than at the primary level (Jarrett and Anderson 1989). This is mostly due to the high costs of providing upper-level education. In 1986, the allocation of expenditure was 52 per cent to primary, 16 per cent to secondary and 26 per cent to tertiary education even though 87 per cent of the students were at the primary level and one per cent were at the tertiary level (Jarrett and Anderson 1989, p. 95).

The government has been attempting to improve access to education at all levels through the provision of buildings and teacher training. Free primary school education has been provided with subsidies at the secondary level (Fairbairn 1993). Some progress has been achieved. Between 1970 and 1992, the primary enrolment rate increased from 52 per cent to 73 per cent, and the secondary enrolment rate increased from 8 per cent to 12 per cent (Economic Insights 1996, p. 111).[69] Despite these improved figures, the picture at present is gloomy. According to Allen and Bourke (1997, p. 12), schools are currently suffering from a lack of facilities and funds to finance their operations.

8.4.3 Disparities in educational achievement

Marked gender and spatial disparities persist in education despite recent remedial efforts. Howlett et al. (1976, p. 160), for example, reported that education opportunities were least in the more remote and crowded parts of Chimbu Province. Rural areas tend to suffer more than urban areas from lack of educational opportunities. Gender disparity 'increases at each successive level of education' (Economic Insights 1998, p. 108). Females lag behind males in literacy and in all levels of schooling, are poorly represented at upper secondary and tertiary levels, and participate little in vocational training (Avalos 1995, pp. 75-78).

8.4.4 The role of public education and training services

Increased public expenditure on education and training in general should remain a high priority for the government in Papua New Guinea. From the specific viewpoint of this study, however, there are two areas of expenditure that are critically important to the welfare of tree crop smallholders. First, rural areas tend to suffer most from inadequate public education facilities and services, and hence tree crop smallholders are more disadvantaged than most people are. Second, development policy makers are increasingly appreciating the importance of timing in the provision of public services, such as education, for the formation and maintenance of human capital. The government could ensure that its provision of public education resources in rural areas is counter-cyclical, making it yet another tool in managing the risks faced by households that rely heavily on income from tree crop production. That is, resources allocated to education and training should be greatest at those times when the householders are least able to afford to pay.[70]

Increasing the public funds made available for education and training is a necessary, but not sufficient, condition for rural development in Papua New Guinea. Inappropriate and inefficient use of these funds will quickly dissipate any benefits. Establishing an efficient education system is a hazardous process, even in the most developed nations.

8.5 Rural Health and Nutrition

8.5.1 Performance in the provision of rural health services

Public health services have been provided through a three-tiered primary health care system: village, district and large towns. The government of Papua New Guinea was spending approximately three times more on health care services than its counterparts in other developing countries until recently. As a result, there had been a substantial improvement in health service staff per head of population in the early years after independence (Jarrett and Anderson 1989).

Over the past decade, however, rural health services have declined alarmingly to the point that they no longer exist in certain areas (Allen and Bourke 1997, pp. 12–13). Indeed, Lieberman and Heywood (1995, pp. 84–85) set in sharp relief the quality of current health delivery arrangements with the system that operated in the late 1970s. Chand (1997, p. 95) reviewed available data and concluded that 'there has been a general deterioration in the level of health status', due to 'the decline in resources allocated on a per capita basis to health' and 'the low level of resources devoted to the sector'.

Allen and Bourke (1997, p. 13) noted an acute shortage of equipment and supplies:

> It is apparent that there has been a general run down in health services, in particular in the more remote areas. A random audit of health services at all levels showed a shortage of important drugs as well as such things as syringes and local anaesthetic. Some health centres had received no funds at all from Provincial Government for more than 12 months.

The system is hindered by a lack of skilled health care workers (Economic Insights 1998, p. 111), poor village-level supervision, and an apathetic attitude towards local self-help groups (Jarrett and Anderson 1989). Lieberman and Heywood (1995, p. 87) highlighted 'the difficulties encountered in operating a health system that has not only grown in size and complexity, but that has also lost much of its flexibility and sensitivity to local conditions'. Jarrett and Anderson (1989) recommended the redirection of public funds from the urban hospitals to small-scale health services in rural areas.

8.5.2 The role of public health and nutrition services

Contribution to economic development

Public health and nutrition contribute to higher labour productivity, food output and income growth (Jarrett and Anderson 1989). For this reason, increased public expenditure on health and nutrition services in general should remain a high priority in development planning. As for public education and training (section 8.4), attention needs to be given to rural public health services, in particular. Yet a simple rural-urban dichotomy can be misleading. Chand (1997, p. 103) pointed to large inter-provincial and even intra-provincial variations in health status, where 'one would expect provinces that are less monetised with more dispersed population in difficult areas to access to be worse off than those with the opposite attributes'. As for public education and training, the provision of public resources for health and nutrition services should be highest at times when commodity prices are low. This is the time when householders are least able to afford health inputs and are most susceptible to diseases and illnesses.

Women's health

Avalos (1995, pp. 74–75) examined women's health and its influence on economic development given the important role of women in determining the health of all members of the household, particularly children. She emphasised a number of factors that cause severe health risks to women, including their heavy workload (Overfield 1995), the way they are treated in marriage, malnutrition and maternal health factors. Differences are great in the health status of women between provinces, judging by the large inter-provincial differences in life expectancy (Avalos 1995, p. 74).

Tree cropping and nutritional status

In one of the most thorough studies of the relationship between cash cropping and nutrition in Papua New Guinea, Bourke (1988) found support for the view that increased cash cropping has a positive impact on nutritional status. He proffered two explanations for this relationship, backed by empirical evidence from the Highlands. First, he adduced an inverse relationship between the consumption of rice and the supply of sweet potatoes. Second, he produced evidence that low nutritional status of children was linked to low cash incomes.

Finlayson et al. (1991, p. 5) summarised the evidence on the relationship between cash cropping and nutritional status as follows:

> Thus, apart from the oil palm industry, where information is unreliable, the available evidence suggests that export cash cropping has been associated with improved growth of children and increased weight and height of adults. However, there has been no major study which has verified this by taking into consideration other variables ... that may affect nutritional status.

Results from their own quite exhaustive study were equivocal on this issue, emphasising the importance of counter-cyclical provision of public goods, such as health and nutrition services, to maintain human capital in rural areas:

> The conditional nature of the impact of commercialisation on nutritional status of children at Karimui is clear .... It seems that, under 'normal' conditions, the impact of the more diversified and better quality diet that cash makes possible is positive. On the other hand, in the early stages of commercialisation, 'normal' conditions are often overtaken by economic adversities of one sort or another. Those households which are most committed to the commercial sector may have cut themselves off to a large extent from subsistence food sources and so may be more vulnerable to set-backs [in nutritional status] than traditionally orientated households.
>
> (Finlayson et al. 1991, p. 186)

8.6 Law and Order in Rural Areas

8.6.1 Social differentiation in tree crops development

Perennial crop production is conducive to economic and social differentiation, to a greater extent than other cash crops (Ruthenberg 1980, p. 260). The tree crops

sub-sector has been at the centre of the development of capitalism that has fostered this differentiation in rural areas of Papua New Guinea. Development occurred through the colonial capitalist activities of European settlers. The best example is the capital investment made by settlers in the Highlands who were attracted to the region to grow coffee during the early 1950s (Amarshi, Good and Mortimer 1979, p. 39). The post-war policy of encouraging smallholder coffee production alongside the estates led to an eager response by the indigenous population.

However, participation in tree crop industries by smallholders has been uneven, leading to disparities in income levels in which more accessible regions, especially those near estates, became richer than less accessible ones (DAL 1995a, p. 3). Until the late 1970s, cash incomes from commercial agriculture in Western Highlands Province and Eastern Highlands Province grew to many times the cash incomes earned by around one-half of the provinces that did not participate in this growth in cash cropping (Fleming and Antony 1993, p. 15).

According to Amarshi et al. (1979, Ch. 9), districts not engaged in tree crop production exported labour and consequently suffered from the 'backwash effects' of reduced output, increasing economic and social differentiation. Good and Donaldson (1977, p. 37) also observed growing class divergences and income inequalities among coffee growers. But McConaghy (1985, p. 60) pointed out that accumulation of wealth and prestige did not come without mounting social obligations. Also, Fleming and Antony (1993, p. 15) noted that the impact of commercial tree crops development on economic and social differentiation in rural areas has declined over time because of widening participation in tree crop production and the emergence of more urban-based cash-earning opportunities.

8.6.2 Breakdown in law and order

A breakdown in law and order has been a phenomenon of the past two decades in Papua New Guinea, with serious consequences for the tree crops sub-sector (Yala and Levantis 1998, p. 12). The four main dimensions to the problem that make it a major policy issue in economic development in the tree crops sub-sector are lawlessness, clan warfare, stealing of output, and unethical and illegal behaviour in business activities (Good and Donaldson 1977, Fleming and Antony 1993, pp. 40–42).

Hassall and Associates (1982, p. 160) considered lawless behaviour, and ineffective measures to convict and punish offenders, as possibly the most serious problem in the coffee industry. Early examples of lawless activity in the Highlands are given by Reay (1982) in Western Highlands Province, Bourke (1983) in an Eastern Highlands village, and Shaw (1985).

Monetisation and growing economic and social differentiation have been one of the causes of increased lawlessness, clan warfare and stealing.[71] Gerritsen (1975, p. 21) observed that land disputes and clan warfare had led to action against richer coffee smallholders in areas of intensive planting in the Highlands. Good and Donaldson (1977) noted that, by the 1970s, plantation owners were already calling for tougher penalties against people stealing coffee.

Disputes over land ownership can keep productive land out of tree crop production. Clifford et al. (1984) pointed out, however, that tribal fighting is partly a solution to the problem of an absence of law and order by resolving disputes that would otherwise persist.

The theft of tree crop output has long been a concern, particularly in the coffee industry, with anxiety about its effect on the coffee industry voiced mainly by people in the estate sector. Godden (1980) mentioned three adverse effects of coffee stealing: reduced profitability of plantations, decline in coffee quality, and damage to the morale of estate managers, especially the emerging class of indigenous managers.

Fleming and Antony (1993, p. 41) added to this list the additional marketing costs for smallholder output, especially in more remote areas that have further to transport their produce and where robbery along the Highlands Highway is rife (Yala et al. 1999). A further, indirect consequence of a breakdown in law and order for tree crop producers is the flight of services from rural areas. The best example is banking services, some of which have been withdrawn from rural areas in recent times (section 6.1.2). A major reason for this withdrawal has been increased insecurity in these areas associated with a breakdown in law and order (Paul Barker, Prime Minister's Office, personal communication, 1999).

Tree crop industries survive by their ability to compete in world markets. Yet the best-endowed system of tree crop production could not survive without effective processing and marketing systems. Unethical and illegal behaviour in business activities damage these systems by harming the standing of the coffee industry at home and abroad, and reducing the efficacy of tree crop marketing and processing.

8.6.3 Law and order policy

Clifford, Morauta and Stuart 1984) observed that the breakdown in law and order, and its implications for economic activity, is largely a political problem that stems from poor relations between the state and its citizens, and conflict between government agencies. Godden (1980) suggested three corrective measures in

respect of the coffee industry: improved policing, support by the courts to those charged with policing responsibilities, and strict registration of processing factories. But improved policing is easier to recommend than to put into practice (Leahy 1980, p. 37).

Furthermore, the trouble is much more broadly based than solving local crime problems. To quote a recent World Bank report, Papua New Guinea has experienced "'an almost complete failure of governance" with corruption and political patronage rife and crime "now so severe that it is the biggest single deterrent to business and investment'" (Cole-Adams 2000, p. 11). The breakdown in law and order was recently described by Yala and Levantis (1998, p. 11) as the most important constraint to development. Successful policy and governance reform, of the ilk currently being attempted under the structural adjustment program, lies at the heart of any attempt to mitigate the adverse impacts of a breakdown in law and order on the tree crops sub-sector.

---

60 Mellor (1998, p. 142) pointed out that the national government in Papua New Guinea had recently switched its road maintenance expenditure from the recurrent budget to the development budget.

61 All are positive because these reductions are assumed to be costless in the absence of data on the costs of reducing these margins.

62 Only for oil palm producers was a producer price established after subtracting the transport costs between the farm gate and the mill. Thus, an important component of marketing margins is missing for three of the four industries because of data deficiencies.

63 These margins were between the factory and the point of export for coffee and cocoa, and between receival depot and point of export for copra.

64 The absence of studies is unremarkable considering the complexity of doing them. To begin with, there is the immense difficulty of getting an adequate data set on changes in prices and the flow of traffic of goods, services and people induced by a change in facilities. This difficulty is compounded by the multipurpose nature of most infrastructure, which means it is not sufficient to examine any change purely from the viewpoint of, say, the tree crops sub-sector or, more so, one particular crop within the sub-sector. The varied ability of users to make use of facilities is also a complicating factor.

65 This lack of building of bulk militates against achieving economies of scale, especially in copra marketing (Yarbro 1992, pp. 20–21).

66 Any equity concerns about producers in less accessible locations suffering from such a pricing procedure could be addressed through a more general public policy of rural freight subsidies, discussed in section 8.3.

67 See footnote 53.

68 The opportunity cost of these funds was assumed to be 10 per cent per annum.

69 The comparable figures for females alone are from 39 per cent to 66 per cent for primary enrolment rates and 4 per cent to 10 per cent for secondary enrolment rates (Economic Insights 1996, p. 111).

70 The importance attached to education by households producing tree crops is not in question. In a survey of cocoa and coconut smallholders recently carried out by CCRI, earning money for paying school fees ranked second in importance among factors influencing cocoa and copra output (behind cocoa price) (Eric Omuru, CCRI, personal communication, 2000).

71 Yet it is only one of many factors. For instance, Levantis and Gani (1998, p. 91) identified the introduction of the minimum formal sector wage, fuelling rural-urban migration, as another major cause of 'the law and order problem' that was not related to social differentiation in rural areas.

CHAPTER 9
MACROECONOMIC POLICIES

This chapter commences with a discussion of the relevance of the macroeconomic setting to tree crop production in Papua New Guinea. Specific attention is paid to the relative efficacy of the conventional macroeconomic tools of monetary and fiscal policy, commodity price stabilisation and other measures in handling the effects of export revenue variability in the tree crops sub-sector. Because of the strong export orientation of tree crop industries, the two other main areas of interest in macroeconomic policy management are manipulating the exchange rate and trade policy. They are discussed in sections 9.2 and 9.3, respectively.

9.1 Macroeconomic Setting and the Stabilisation of Export Earnings

9.1.1 Conventional macroeconomic tools versus commodity price stabilisation

Some observers, such as Jarrett and Anderson (1989), have maintained that Papua New Guinea would be better off with conventional monetary and fiscal policy instruments to manage the macroeconomy. Appropriately used, fiscal and monetary measures can reduce price variability around the trend without the need to stabilise prices (Ariff 1994).

Other analysts have disagreed. Guest (1989) argued that the narrow tax base and high cost of public services are too restrictive for the effective use of fiscal policy.[72] He also pointed out that policy effectiveness is limited by import leakages and large stocks of foreign exchange in the reserve assets of the banking sector. A number of observers have felt that the usefulness of monetary policy is likely to be ineffective in a stabilising role. The limited development of the financial base has been identified as a major drawback to effective stabilisation management (Jolly et al. 1990). It is constrained by the limited access to financial institutions in rural areas (Guest 1989), thereby doing little to assist the farmer (Stein 1991). Guest (1989) argued that price fluctuations are too large, and the domestic multiplier too small, to counteract the impact of commodity price instability with fiscal and monetary policy. Finally, Gilbert (1993) suggested that the use of macroeconomic policies for cushioning the domestic economy from exogenous price movements could create distortions that lead to a significant misallocation of resources, especially when only one sector is affected.

Manning (1998, pp. 25–27) identified a number of shortcomings in the execution of monetary policy in Papua New Guinea, with particularly harmful effects in recent

years. But he also suggested a number of policy initiatives that would make it a powerful tool for more stable economic growth.

9.1.2 Alternative approaches

A graduated export tax has been suggested as an attractive alternative to price stabilisation when used for fiscal contraction to avoid the adverse effects of export booms on the domestic economy (Lam 1984). In addition to the macroeconomic stabilisation advantages, the main argument in its favour is that large revenues are collected during export boom periods, when producers can most afford to pay, and low or no revenues are collected during periods of depressed world prices, when producers can least afford to pay. Unfortunately, there are practical limitations to its use in Papua New Guinea. In particular, the degree of progressiveness required in the graduated rate to have a marked effect on economic stability would be too great from an equity viewpoint.

Natural portfolio effects can reduce the negative macroeconomic impacts of commodity price volatility in developing countries such as Papua New Guinea. There are two dimensions to natural portfolio effects. First, countries may have a portfolio of commodity exports the prices of which fluctuate in opposite directions and offset each other. Second, the prices of commodity exports may move in approximately the same direction over time as those of major import items. Larson et al. (1998, pp. 3–5) studied the potential for counteracting movements in commodity export prices. They found that, with the exception of timber and petroleum, 'prices do not demonstrate negatively significant relations' (Larson et al. 1998, p. 3). Pindyck and Rotemberg (1990) found evidence of 'excess co-movement' of unrelated commodities. Their results were disputed by other analysts, who found only weak or intermittent excess co-movement of commodity prices. Overall, the empirical evidence suggests no strong natural portfolio effects among commodity prices (Larson et al. 1998, p. 4).

On the issue of positive correlation between commodity export and import prices, Larson et al. (1998, p. 4) concluded that:

> ... for countries who have exposure on both exports and imports there is some portfolio effect since commodity export prices may correlate positively with commodity import prices. For example, beverage prices are positively correlated with grain and oil prices. Thus, a coffee or cocoa exporter that imports wheat or oil has some natural hedge.

This situation seems apt for Papua New Guinea in one respect, in that cereal imports tend to covary with commodity exports. For instance, increases in food imports eventuate when export prices are high, and vice versa.[73]

9.2 Exchange Rate Manipulation

9.2.1 History of exchange rate as a policy instrument

Exchange rate manipulation was virtually ignored as a policy instrument influencing export agriculture until the late 1980s (Fallon et al. 1995, p. 111), when Jarrett and Anderson (1989) and the World Bank (1992) recommended an exchange rate policy for Papua New Guinea that was combined with effective wage constraint. From independence, the government followed a 'hard kina' policy to constrain domestic expenditure, in order to avoid large budget deficits and high levels of foreign borrowing (Duncan et al. 1995). This strategy managed to maintain a convertible currency and relatively low inflation, as well as artificially supporting the value of the kina throughout the 1970s. But it put pressure on tree crop smallholders by lowering prices of primary commodity exports in kina terms, a burden made more difficult to bear by already low world commodity prices.

Deteriorating terms of trade from 1980 to 1982 forced a gradual revision of the 'hard kina' policy (Duncan et al. 1995), and real devaluations have been allowed since 1983. The first structural adjustment program was put in place in 1990 as a consequence of diminishing public funds and closeness to default on World Bank loans. In that year, the government devalued the kina in nominal terms by 10 per cent as part of the requirements of the structural adjustment program, and the real effective exchange rate fell by a similar proportion. Speculation against the currency increased in August 1994, forcing a 12 per cent devaluation in September 1994, followed by suspension of foreign exchange trading and a decision to float the kina in October 1994 (Fallon et al. 1995, p. 111).

Despite events in 1990, the nominal exchange rate had retained its level between 1985 and 1993 under the 'hard kina' policy, although the real effective exchange rate devalued by 9 per cent over the same period (IMF 1999). Existing financial policies had by then become unsustainable, with a breakdown in fiscal discipline, persistence of a high cost structure, including increases in wage levels unsupported by productivity growth, and poor domestic performance (Fallon et al. 1995, p. 111). The consequence, given the relaxation of exchange rate policy, was a decline in the real effective

exchange rate by 35 per cent between 1993 and 1998 (IMF 1999).[74] In sum, the real effective exchange rate in Papua New Guinea has declined progressively and substantially since 1991 (Fleming 1999c, p. 50).

9.2.2 Impact of devaluation on the tree crops sub-sector

Supply response to devaluation of the kina

Devaluation and the subsequent float of the kina in October 1994 have had both negative and positive impacts on the agricultural sector. On a positive note, the agricultural sector has attained a greater level of international competitiveness (Kannapiran 1999c), and increased agricultural export earnings.[75]

Supply response to a devaluation of the kina was estimated for coffee (McLaren and Fleming 1999), cocoa (Ruhle and Fleming 1999), copra (Fleming 1999b) and palm oil (Fleming 1999a). Results were reported for smallholders and estates for each crop. In general, they show a strongly positive exchange rate elasticity of supply, but with substantial variations.[76] Smallholder elasticities vary from 0.74 for copra to 2.37 for cocoa. Estate elasticities were found to be lower than those for smallholders, except for coffee where no significant difference was detected. The sign was unexpected in the case of copra estates, implying that they reduce supply in response to a devaluation of the kina.

Complications of contemporaneous price support

Government support prices were significantly above world prices for some years in the first half of the 1990s, insulating growers' revenue from exchange rate effects. As a consequence, the immediate impact of the devaluation may not have been felt by producers (depending on the extent to which bounties had been passed back from exporters to producers). Yet growers would have felt the full impact of devaluation in terms of higher imported input prices, and there may have been costs associated with exchange rate volatility in recent years (Kannapiran and Wosae 1995). The full impacts of devaluations would have been felt in the second half of the 1990s, however, as price support had all but ceased after 1995.

Impacts of devaluation on input prices and wages

While it is true that the international competitiveness of tree crop producers in Papua New Guinea is significantly affected by the exchange rate, much depends on its impact on the level of the major input in tree crop industries, labour. Devaluation is directed at increasing agricultural export earnings and adding greater flexibility to rural wages. Woldekidan (1994) estimated the short-run effects of 10 per cent

devaluation under different scenarios about the impact on wages. No real changes would occur in tree crop output and exports with full indexation. Partial indexation of wages to changes in general prices would yield varied changes; all are positive except for estate copra. Woldekidan (1994) predicted some quite significant positive output changes when aggregate money supply was fixed but wages were allowed to vary freely. The largest increases were estimated for smallholder palm oil (44.9 per cent), estate cocoa (17.5 per cent) and estate coffee (14.8 per cent). Moderate increases were estimated for smallholder cocoa (8.5 per cent) and smallholder coffee (6.7 per cent). Estate copra was estimated to encounter the only decline in output, but by only 0.7 per cent (Woldekidan 1994, p. 3).[77]

Is it possible to contain domestic price increases caused by devaluation?

Garnaut (1991) estimated that a high proportion of exchange rate volatility is transmittable to domestic prices in the Asia-Pacific region, and warned against using exchange rate policy in isolation from other macroeconomic policies. The adjustment lag is brief in small open economies, with Garnaut and Baxter (1983, p. 154) estimating that it is complete within 12 to 18 months in the economy of Papua New Guinea.

9.2.3 Flexibility in managing the exchange rate

Important points about an exchange rate policy are to recognise that flexible exchange rate management requires skills and supporting measures, and to acknowledge its limitations when used in isolation from other policy instruments. The issue was expressed well by Fallon et al. (1995, pp. 109–112):

> The potential dynamic gains from a focus on the tradeables sector are ... an important component of the argument in favour of flexible management of the exchange rate. However the ability of the economy to realise this potential is dependent on other factors that constrain growth and development. The greater are these constraints, the less likely that the economy can respond. ... Credible complementary policies are also important in ensuring that the move to a floating exchange rate regime is successful. ... if [they] are not forthcoming the floating exchange rate regime will not be sustainable. ... it will require considerable strengthening of policy making institutions. ... Active use of the exchange rate as a policy instrument is only one of a wide range of complementary policy measures. ... Complementary monetary and fiscal policies are of critical importance ... [as are] complementary structural policies focussed on improving the basic environment for economic activity.

Garnaut (1991, p. 23) reached a similar conclusion:

> The literature cautions against assessing exchange rate policy in isolation from the setting of other macroeconomic instruments. Rather, the proper place of the exchange rate is as an integral part of macroeconomic policy in general, so that it is set simultaneously with expenditure, wages and trade policies.

Recent discussion has centred on options for the exchange rate regime in Papua New Guinea. These options are clearly described, and their relative merits assessed, by Economic Insights (1998, pp. 74–77). The most sensible recommendation is to allow the exchange rate to fluctuate in line with its external equilibrium rate,[78] and ensure that there is no return to a 'hard kina' policy where the kina is overvalued to the considerable detriment of the tree crops sub-sector. One key consideration is the fortunes of the mineral export sub-sector. Events in this sub-sector that lead to exchange rate variation will continue to have significant effects on tree crop industries.

9.3 Trade Policy

9.3.1 Rates of protection

Zeitsch et al. (1993) reported on the effective rates of assistance provided to industries in Papua New Guinea in 1992. The effective rates of protection for the tree crop industries under study ranged from zero for smallholder coffee and cocoa to –20 per cent for estate copra. Zeitsch et al. (1993, p. 7) concluded that 'the structure of tariff protection heavily penalizes the agricultural, mining and forestry sectors as indicated by their negative rates of assistance'. A 50 per cent tariff cut was estimated to increase coffee output by 3.3 per cent, cocoa output by 3.5 per cent, palm oil output by 1.4 per cent and copra output by 1.8 per cent (Zeitsch et al. 1993, p. 13). On the other hand, the imposition of a ban on further imports of food products would lead to reductions in output of coffee by 0.6 per cent, cocoa by 0.7 per cent, palm oil by 0.1 per cent and copra by 0.8 per cent.

9.3.2 Scope for further reduction in protection

Views differ on the effects of government trade interventions on the economy in Papua New Guinea, but there is enough evidence to conclude that protectionist policies have had an adverse impact. The ban on certain food imports in the context of an expanding mineral sector was shown to increase output in the food processing sector but reduce GDP by 0.6 per cent, with lower output levels for all tree crop industries. In contrast, tariffs were found to increase GDP and create expansion in the coffee industry (Economic Insights 1994, p. 93).

Jarrett and Anderson (1989) maintained that import bans have had a negative impact on the agricultural sector as a whole, by encouraging inefficient use of resources in two main ways. First, resources used in the production of agricultural exports in which Papua New Guinea has a comparative advantage have been diverted into less profitable and protected import-competing activities. This, they claimed, has decreased the overall efficiency and growth of the agricultural sector and raised the purchase price of food. Second, bans on food imports adversely affect the rural poor who, as low-income net buyers, spend a large proportion of their income on food. The import restrictions have increased the costs of farm inputs, thereby raising the price and lowering the quantity, quality and variety of food available. They have also reduced the nutrient intake and labour productivity of the poor (Jarrett and Anderson 1989).

Duncan et al. (1995) suggested that the government should ensure that trade policies do not add to the 'Dutch disease', which depresses the production of traded goods outside of the resource sectors. They felt that a more uniform set of tariffs would increase government revenue and discourage the movement of resources into high-cost industries. Jarrett and Anderson (1989) suggested that the government apply a uniform export tax that would reduce the opportunities for potential import-replacing producer groups to seek favours from the government.

There is therefore scope for the government to provide assistance to the tree crop industries by reducing protection levels, a process set in train in the current structural adjustment program (see section 2.2.1). By lowering tariffs, the government reduces the negative rates of protection on tree crop industries and increases their economic welfare. Despite the liberalising efforts of the structural adjustment program, there is still significant leeway for the government to lower tariffs in general.

---

72 The latter argument might also be applied to commodity stabilisation schemes.

73 The 1980s were a period of substantial variation in commodity export prices, and provide a useful example of the way in which export prices were quite closely tracked by food imports. A correlation coefficient of +0.78 was estimated using annual data on food import values and the export price index from NCDS (1995) for the period from 1980 to 1990.

74 King and Sugden (1997, p. 29) speculated that wages and the prices of locally produced products might not have increased by as much as the consumer price index following the devaluation of the kina in 1994. Thus, the decline in the real exchange rate might have been greater than indicated.

75 This is especially so for smallholders who would benefit more than estates since they require fewer imported inputs.

76 The effects of a devaluation depend heavily on their timing, particularly the position in the production cycle, and the activities of marketers in passing through the changes in export prices in local currency to producers (Boccara and Nsengiyumva 1995).

77 These results need to be treated with caution. Although good progress has been made in the development of the computable general equilibrium model used to make these estimates, many parameters are still the subject of guesswork, and these types of models are notoriously fickle when key parameters are altered.

78 Admittedly, it is not a simple matter to assess when the real exchange rate is in both external and internal equilibrium, particularly internal equilibrium (Elek 1995, p. 149).

CHAPTER 10
ACHIEVING GREATER GENDER EQUITY IN SMALLHOLDER TREE CROP PRODUCTION

10.1 Importance of Gender Relations

10.1.1 Widespread influence of gender relations on policy making

Gender relations permeate virtually all dimensions of policy making in the tree crops sub-sector. Allen (1993, p. 17) estimated that 'women typically contribute between 50 and 70 per cent of agricultural labour' in Papua New Guinea, yet 'are disadvantaged in almost all aspects of rural life and in particular in any relations between the village and the State, or commercial interests'. This view is supported by the findings of Overfield (1995) in his study of coffee production in Eastern Highlands Province. He found widespread evidence of gender discrimination in household commodity production.

Most progress in improving the lot of women has been achieved through the 'fairly well-developed structure of women's organisations at national and provincial levels' (Avalos 1995, p. 81) rather than formal policy-making processes. Avalos (1995) commented that women's and other non-government organisations had undertaken much of the work in dealing with the problems faced by women in the crucial fields of health, education and general social conditions. But she concluded that the main political approach has been to view women's issues narrowly in terms of a welfare issue rather than a problem of inequality (Avalos 1995, p. 82). The manifestation of this inequality in the households producing tree crops is of particular concern in this study.

10.1.2 Gender relations and household production of tree crops

Intrahousehold relations

Intrahousehold gender relations have an impact on many aspects of the rural economy because women are in a weaker bargaining position within the household, demonstrated by their longer working hours, considerably lower returns to their labour and their limited access to the economic benefits of production. The relative incentives for women to be involved in coffee production are not as great as for men. Overfield and Fleming (1999) demonstrated that this influences levels of technical efficiency in smallholder coffee production.

Land tenure rights

The weaker bargaining position of women relative to men within the household is determined in large part by their limited access to productive assets, in particular land (Barnes 1981, pp. 267–268). According to data from a survey by Wilson and Evans (1975, p. 12), women owned less than 3 per cent of the total number of coffee gardens in Western Highlands Province and Chimbu Province, and 4 per cent

in Eastern Highlands Province. Furthermore, the size of the gardens owned by women was on average smaller than the average size of gardens owned by men. Nihill (1991) observed that women command only secondary use rights to land.

Patrilineal customary land tenure set the initial terms under which conjugal contracts[79] are negotiated. In return for access to land, women must provide enough food for household requirements, provide labour on coffee plantations that is often unremunerated, and complete a large range of household tasks (Overfield 1995). This is especially the case in the Highlands where the nature of social relations has changed with the imposition of colonialism and capitalism.

Overfield (1995) argued that colonialism and capitalism had similar impacts on the people of Papua New Guinea because they were, in effect, similar processes. Capitalism promoted the individual over any other grouping. Extension officers in the colonial state encouraged coffee production as 'male' and 'modern'. This approach has devalued the worth of women's main work, subsistence production (Barnes 1981), reduced their bargaining power (Overfield 1995) and increased individualism in land tenure patterns.[80] The introduction of coffee intensified competition for land partly because it was another land-intensive activity, being a crop requiring significant plant spacing (Overfield and Fleming 1999). Despite greater individualism in land ownership, which is now less clan-orientated (Grossman 1984), women have not obtained more secure rights to use land. Access to land sets only the general terms under which conjugal contracts are drawn: the 'contract' and what happens in daily life are subject to the influence of many other factors (Overfield 1995).

Overfield (1995, p. 202) described the relative bargaining position between men and women within households as follows:

> People do not move costlessly between one static equilibrium and another ... but rather move through a process which has positive real costs(both economic and social. The key factor which appears to determine people's relative bargaining power within households is their access to resources. Women clearly have much lower access to productive resources than men with an associated weaker position, which is the result of two sets of factors. Firstly, there is the highly patriarchal tradition (endogenous) of the society which severely restricts their access to the most basic of productive assets (land). Secondly, introduced market exchange relations have devalued their 'worth' in society but women have not been able to access the considerable economic benefits. ... they do not have sufficient access to the necessary

productive inputs or control over their own labour time. Patriarchy and capitalism together have 'conspired' to create a very uneven distribution of burdens and benefits.

Labour allocation

An uneven distribution of labour inputs is exemplified by data on the tasks of coffee smallholders collected by Overfield (1995) and reported by Overfield and Fleming (1999, Table 1). The broad evidence presented by Overfield and Fleming (1999) implies that no overall labour constraint exists in coffee production, but tasks within the household are not divided equally between men and women. Women work over three times as long as men do, with the unevenness most pronounced in housework and reproductive activities. Coffee production is the activity with the greatest equity in labour allocation.

In the Highlands, labour use is more intensive during the four to five months of the main coffee-harvesting period, particularly between April and the end of August. Collett (1992) contended that one of the main factors constraining development and rural economic differentiation in the Highlands was a labour constraint during this period, but he presented no time allocation data to substantiate his claim. Overfield (1995, pp. 92, 292) did produce empirical evidence that showed an overall labour constraint during periods of coffee harvesting, especially a female labour constraint. He noted that some labour is redirected from other areas such as food production within a planned strategy to meet both cash and food security objectives, but labour use is still higher overall. Many households now face a female labour constraint concurrent with considerable male underemployment.

The results presented by Overfield and Fleming (1999) show that male labour constraints during the coffee-harvesting season do not significantly influence technical efficiency in smallholder coffee production. This is unsurprising given the widespread occurrence of male underemployment. On the other hand, they found that female labour constraints during the coffee-harvesting season do have a marked negative effect on technical efficiency. A reallocation of household tasks to a more equitable workload between men and women should have two positive outcomes: reduction in the level of rural underemployment and relief of the large work burden imposed on many women.

Cash income and its distribution within the household

Gender relations within the household also influence income levels in households producing tree crops (for example, Johnson 1988, Overfield 1995). They can have a

negative impact on the distribution of income and economic incentives (specifically returns to labour) for women. Survey data collected by Overfield (1995) and reported by Overfield and Fleming (1999, Table 3) show that gender returns in coffee production are very uneven, with women receiving about one-third of the cash returns of their male counterparts. This becomes more extreme as coffee prices increase, suggesting that men retain most of the price increases with only small benefits being passed on to women.

Overfield and Fleming (1999) also found that the incentive for women to supply their labour substantially influences technical efficiency in smallholder coffee production. This result is consistent with the findings by Overfield (1995, pp. 142–148) that hourly returns to female labour positively influence household yields, output and income.

Coffee is the most important single source of cash income for households in the Highlands. Returns to labour are, on average, much higher in coffee production than in food production (Overfield and Fleming 1999). Yet sales of food continue to be very important because they tend to be the main, even sole, source of income for women (Overfield 1995, p. 183).

10.1.3 Indirect importance of gender relations in the tree crops sub-sector

Some of the important influences of gender relations on the tree crops sub-sector do not bear directly on tree crop policies. They include issues relating to education, health and nutrition. As noted in sections 8.4 and 8.5, gender disparities persist in levels of educational attainment, widening at each successive level of education, and rural health services that affect women more than men are chronically under-resourced.

The relationship between women's participation in tree crop industries and nutritional status has been explored by, among others, Finlayson et al. (1991). Their results show tentatively that 'participation by women in smallholder households in the cash economy increased cash incomes that were spent substantially on buying foods that added diversity, and perhaps quality, to diets' (Finlayson et al. 1991, p. 181). Women 'devote a greater proportion of their cash incomes to buying food, especially staples, than do men' (Finlayson et al. 1991, p. 184).

More direct influences on tree crop production of gender relations are discussed below in relation to research and extension, marketing of tree crops and rural finance.

10.2 Influence of Research and Extension on Gender Relations

Allen (1993, p. 17) identified intensification of agricultural production as a process that has been commonly associated with greater gender inequity in rural areas. Barnes (1981, p. 175) observed that intensification of coffee production in the Highlands led to large increases in women's work, where women's labour was diverted from food production. But the work involved is mainly the 'most time-consuming tasks (weeding and picking)' whereas men mainly undertake tasks 'requiring some knowledge of coffee technology (planting, shading, fencing and pruning)' for which only they receive training (Barnes 1981, p. 174). The findings by Overfield and Fleming (1999) from their study of smallholder coffee production in Eastern Highlands Province confirmed this state of affairs. They found that the marginal productivity of male labour is much higher than that of female labour, on average, and the gulf is especially great for 'best practice' coffee-producing households.[81] Another finding by Overfield and Fleming (1999), that there is no significant difference in the technical efficiency of male and female labour in smallholder coffee production, indicates that there is no inherent difference in the quality of labour supplied by women and men.

The above observations suggests that productivity gains in research in tree crop production have mainly flowed to men's work rather than women's work. Yet, judging from a review of the research planning documents of tree crops research institutes, research managers have seldom considered gender issues in setting research priorities and formulating their research programs.

10.3 Gender Relations in the Marketing of Tree Crops

Temon (1990) established that female coffee sellers were paid lower prices than their male counterparts in his survey of coffee marketing activities in Western Highlands Province. His results contrast with those arrived at by Yala et al. (1999). From the results of their survey of coffee marketing at sites in Eastern Highlands Province, Yala et al. (1999) found that gender was not a significant determinant of price formation in roadside coffee marketing. Men and women were paid almost the same price, although men sold more coffee and received more income per transaction.

These conflicting results, and the fact that they are confined to one tree crop, suggest further research is needed to establish whether women are disadvantaged in the marketing of tree crops.

10.4 Access to Rural Financial Facilities

Women in rural households are especially disadvantaged in gaining access to rural credit. Avalos (1995, p. 79) reported on a study by Booth (1991) who calculated that women received only 4.5 per cent of loans provided by the Agriculture Bank of Papua New Guinea in January 1991. Apart from the direct constraints imposed on women seeking credit by their weak bargaining position in rural society in general, women are indirectly disadvantaged by the land tenure system (section 10.1.2).

As stated above in section 6.2.2, lending to smallholders is constrained by land tenure arrangements and availability of collateral. Efforts to develop customary land through the provision of credit by, for example, lease-lease back arrangements and the Clan Usage Agreement have been initiated through landowners. Hence, women's disadvantaged position in respect of land ownership translates into a disadvantage in providing collateral for loans through these initiatives.

10.5 Assessment of the Need for Studies of Gender Relations

The empirical evidence with arguably the greatest policy significance relates to the impact of gender relations on productivity and the distribution of returns in production and marketing. It provides support for the proposition of a gender bias favouring men in marketing, possibly, but certainly in the provision of credit, extension services and improved technology for cash cropping activities and/or the allocation of rewards in production activities. The productivity losses ensuing from these production relations can reinforce existing gender inequities in rural areas.

These losses derive from situations where men have at their disposal more advanced production methods in the more challenging tasks they perform. They could be mitigated by upgrading the delivery of special extension services to women to improve labour productivity in the tasks they perform. Extension action is warranted on two fronts. Greater attention needs to be directed to the introduction of improved methods and more rewarding tasks in women's work in tree crop production.

79 This term was used first by Whitehead (1981).

80 This may be partly a consequence of the more intensive and longer periods of land cultivation than previously, given coffee trees are a perennial crop, and would have happened following the introduction of sweet potato into farming systems (Overfield 1995).

81 In contrast, Overfield and Fleming (2000) found that the marginal productivity of labour in food production on 'best practice' farms was significantly higher than that of males among the same sample of households.

CHAPTER 11
SUGGESTIONS FOR FURTHER POLICY ANALYSIS

11.1 Improved Capability to Generate and Use Data for Economic Policy Analysis

Fragmentation, unevenness and reliance on a few key individuals are striking features of the analytical capacity for economic policy making in tree crop industries in Papua New Guinea. The latter feature is perhaps inevitable in a small country, but it has been accentuated by the recent decline in capacity for policy analysis and planning in DAL. Institutional strength to analyse economic policies resides more within the industries themselves than in the public sector. Yet resources are patchy even within individual industry organisations.

Economists in CIC, in particular, have undertaken some very useful economic analyses (for example, Temon 1990, Overfield 1991, 1993, Smith 1992, Overfield and Kufinale 1993, Kufinale 1994, Stapleton 1998) and produce informative annual coffee reports. Economists at DAL also did some very useful work in the early 1990s (for example, Simmons and Anoser 1993, Simmons and Yarbro 1993). But staff shortages and other requirements on their time have meant that both industry and public-sector economists have been hard-pressed to find sufficient time for all the analyses they need to do. This has limited the coverage of the analytical work undertaken so far, and important knowledge gaps still exist. Nevertheless, the work done has been of sufficiently high quality to suggest that future industry analyses could lead to the accumulation of a better knowledge base for policy making provided there are sufficient staff, and commensurate other resources, to undertake the work.

Currently, the Commodity Working Group, set up to formulate policies relating to tree crops following the crisis of low world commodity prices a decade ago, lacks any institutional capacity to analyse specific policy issues. It relies overwhelmingly on the expert knowledge of its members. A trans-institutional policy analysis unit could be considered to overcome the current lacuna in policy advice provided to the Group. This should include analysts from the tree crop industry organisations.

As indicated in section 3.6.2, the government of Papua New Guinea and international development agencies both have roles to play in improving the situation. They could begin by putting in place a funding system that enables organisations in the tree crops sub-sector to accumulate information through domestic data-collection processes undertaken on a regular basis.

11.2 Data deficiencies for policy making and their alleviation

One of the strongest recommendations to come out of the study does not concern a specific policy option. Rather, it concerns the uneven nature of information available for policy analysis in the tree crops sub-sector. The study has shown that the condition of tree plantations in all four of the tree crop industries under study can have a substantial effect on industry health. Industry simulation models (Fleming 1999e, Fleming and Milne 1999) demonstrate how a relatively small change in the underlying production relations can substantially alter the economic surplus of the industry.

In a way, this is hardly surprising. Yet it is disappointing that even approximate estimates of key data are lacking. Fleming (1999f) gave two examples of data deficiencies that impede economic analysis in the tree crops sub-sector:

- Records of the distribution of cocoa seedlings were assiduously kept from 1984 to 1995, and details were published regularly (for example, Peter 1997). This procedure now seems to have been discontinued. It is unfortunate because it enabled at least 'ball-park' figures to be calculated for newly planted areas which, if continued over a long period, would help to build a good picture of the demographic structure of trees, and hence production potential, in the cocoa industry. No information is available on the distribution of seedings in the coffee and copra industries.
- Various estimates have been made of average yields of tree crops from samples of smallholders under different conditions and in different locations. But no attempt has evidently been made to construct a coherent representation of yields for different groups of farmers under different agroecological conditions, different age groups of trees or different tree varieties.

The fact that empirical results can be changed with moderate changes in production relations suggests that policy makers are largely ignorant about the effects of policy reforms on the tree crop industries. A concerted attempt is needed to improve information in a number of areas, not least the demographic structure and yield capacity of trees.

Use of bioeconomic models developed to simulate activities in individual tree crop industries (section 1.3.3) could help in a couple of respects. First, they could aid in overcoming some of these existing knowledge gaps that demand inter-disciplinary research among staff within industry organisations.

Second, they could point up the major knowledge deficiencies that exist in each industry, as analysts attempt to portray production and marketing activities in their simulation models.

Data at the farm level are an important component of industry studies because it is difficult to collect industry-level data without understanding what is happening in tree crops-based farming systems. Economists in CCRI and CIC have undertaken some useful microeconomic analyses over the past few years. Many have had a strong smallholder orientation (for example, Overfield and Irog 1992, Overfield 1994, Omuru 1995, 1998). DAL has also recently undertaken a couple of farming systems research studies based on farming systems in which tree crops have been the major activity (Ghodake, Cook et al. 1995, Ghodake, Gaupu et al. 1995). Such studies have been a useful source of farm-level information, but more studies and data collection efforts are needed at this level.

REFERENCES

ACIAR (1987), ... *Papua New Guinea Export Tree Crop Survey: Largeholder Cocoa/Coconuts*, Australian Centre for International Agricultural Research, Canberra.

Adams, D.W. (1988), ... 'The conundrum of successful credit projects in floundering rural finance markets', *Economic Development and Cultural Change* 36(2), 355–367.

ADB (1993a), ... *Country Operational Strategy Study for Papua New Guinea*, Asian Development Bank, Manila.

ADB (1993b), ... *Industrial Crops in Asia*, Staff Paper No. 7, Agriculture Department, Asian Development Bank, Manila.

Allen, B.J. (1993), ... 'Issues for the sustainability of agriculture systems in Papua New Guinea, 1990–2015', in *Issues in Papua New Guinea Agriculture*, Australian International Development Bureau, Canberra.

Allen, B.J. and Bourke, R.M. (1997), ... *Report of an Assessment of the Impacts of Frost and Drought in PNG*, Australian Agency for International Development, Canberra.

Allen, B.J., Bourke, R.M. and Hide, R.L. (1995), ... 'The sustainability of Papua New Guinea agricultural systems: the conceptual background', *Global Environmental Change* 5(4), 297–312.

Amarshi, A., Good, K. and Mortimer, R. (1979), ... Development and *Dependency: The Political Economy of Papua New Guinea*, Oxford University Press, Melbourne.

Anon. (2001), ... 'Commodity price index', *The Economist*, 13 January, 112.

Antony, G. (1990), ... *Appraisal of the Expected Economic Effects of Research Projects Planned or Undertaken at the Cocoa and Coconut Research Institute*, Research Bulletin No. 45, Department of Agriculture and Livestock, Konedobu.

Antony, G., Kauzi, G.Y. and Prior, R.N.B. (1990), . *Returns to Research on Insect Pollination of Oil Palm in Papua New Guinea: A Layman's Guide*, Research Bulletin No. 51, Department of Agriculture Livestock, Konedobu.

Antony, G. and Parton, K.A. (1991), ... 'Papua New Guinea's export-crop research: past returns and expected economic effects', *Prometheus* 9(1), 62–80.

Ariff, M. (1994), ... 'The competitiveness of Malaysian exports: policy perspective', Asia Pacific Development Journal 1(1), 91–102.

Avalos, B. (1995), ... 'Women and development', *Pacific Economic Bulletin* 10(1), 73–83.

Bakani, F. (1994), ... 'Reorganisation of agricultural extension services in Papua New Guinea', *Papua New Guinea Journal of Agriculture, Forestry and Fisheries* 37(1), 56–67.

Barnes, H. (1981), ... 'Women in Highlands agricultural production', in D. Denoon and C. Snowden (eds), *A Time to Plant and a Time to Uproot,* Institute of Papua New Guinea Studies, Port Moresby, 265–284.

Binswanger, H.P. and Deininger, K. (1997), ... 'Explaining agricultural and agrarian policies in developing countries', *Journal of Economic Literature* 35(4), 1958–2005.

Boccara, B. and Nsengiyumva, F. (1995), .. *Short-Term Supply Response to a Devaluation: A Model's Implications for Primary Commodity-Exporting Developing Countries,* Policy Research Working Paper 1428, World Bank, Washington, D.C.

Bodman, P.M. (1987), ... *Coffee Report No. 8,* PNG Coffee Industry Board, Goroka.

Bodman P.M. (1989), ... *Monitoring Inter-Provincial Movements of Coffee in Papua New Guinea: A Pilot Study in Enga and Southern Highlands Provinces,* Working Paper No. 7, ACIAR Project 8734, Australian Centre for International Agricultural Research, Canberra.

Booth, H. (1991), ... *Papua New Guinea: A Statistical Profile on Men and Women,* Pacific Mainstreaming Project, Port Moresby.

Bourke, R.M. (1983), ... Fifty years of agricultural change in a New Guinea Highland village, Paper presented to the 1st PNG Food and Nutrition Conference, Goroka.

Bourke, R.M. (1985), ... 'Food, coffee and casuarina: an agroforestry system from the Papua New Guinea Highlands', *Agroforestry Systems* 2, 273–279.

Bourke, R.M. (1988), ... *Taim hangre*: variation in subsistence food supply in the Highlands of Papua New Guinea, PhD thesis, Australian National University, Canberra.

Bourke, R.M. (1993), ... 'Some issues in the agriculture sector of Papua New Guinea', in *Issues in Papua New Guinea Agriculture*, Australian International Development Bureau, Canberra.

BPNG (1998), ... *Quarterly Economic Bulletin* 26(3) (and previous issues), Port Moresby.

Brogan, B. (1981), ... 'Summary', in *Land Policy and Economic Development in Papua New Guinea*, INA Public Seminar, Institute of Public Affairs, Port Moresby, 43–44.

Brogan, B. and Remenyi, J. (eds) (1987), ... *Commodity Price Stabilisation in Papua New Guinea-A Work in Progress Seminar*, Institute of National Affairs, Port Moresby.

Brown, P., Brookfield, H. and Grau, R. (1990), ... 'Land tenure and transfer in Chimbu, Papua New Guinea: 1958–1984—a study in continuity & change, accommodation, and opportunism', *Human Ecology* 18(1), 21–49.

Burgess, R.J. (1981), ... *The Intercropping of Smallholder Coconuts in Western Samoa: An Analysis Using Multi-Stage Linear Programming*, MADE Research Series No. 4, Development Studies Centre, Australian National University, Canberra.

Carrad, B. (1982), ... 'Some economic implications of smallholding coffee expansion, Eastern Highlands Province, 1960 to 1979/80', *Coffee Industry Board Research Newsletter* 2(2), 12–15.

Carruthers, F. (1994), ... 'Management of agriculture sector in PNG economy', *Papua New Guinea Journal of Agriculture*, Forestry and Fisheries 37(1), 9–14.

Cartledge, I.V. (1978), ... *A History of the Coffee Industry in Papua New Guinea: From Inception to the End of 1975*, Coffee Industry Board, Goroka.

Cashin, P., Liang, H. and McDermott, C.J. (1999), . 'Do commodity price shocks last too long for stabilization schemes to work?', *Finance and Development* 36(3), 40–43.

Chand, S. (1997), ... 'Health in Papua New Guinea: a stocktake', *Pacific Economic Bulletin* 12(2), 95–104.

Chand, S. and Stewart, R. (1997), ... 'Economic reforms and structural change in Papua New Guinea: progress, performance and prospects', *Pacific Economic Bulletin* 12(1), 53–69.

CIAT (1999), ... 'Does research reduce poverty?', *Growing Affinities*, December, 1–11.

CIB (1986), ... *Annual Report for Coffee Year Ending 30 September, 1986*, Papua New Guinea Coffee Industry Board, Goroka.

CIC (1992), ... *Assistance to the Coffee Industry: A Submission by the Coffee Industry Corporation Ltd*, Coffee Industry Corporation, Goroka.

CIC (1994), ... *Coffee Growing in Papua New Guinea*, Coffee Industry Corporation, Goroka.

Claessens, S. and Coleman, J.R. (1993), ... 'Hedging commodity price risks in Papua New Guinea', in S. Claessens and R.C. Duncan (eds) (1993), *Managing Commodity Price Risk in Developing Countries*, Johns Hopkins University Press, Baltimore, Ch. 10.

Claessens, S. & Duncan, R.C. (eds) (1993), ... *Managing Commodity Price Risk in Developing Countries*, Johns Hopkins University Press, Baltimore.

Clifford, W., Morauta, L. and Stuart, B. (1984), ... *Law and Order in Papua New Guinea*, Institute of National Affairs, Port Moresby.

CMB (1996), ... *The Copra Marketing Board of Papua New Guinea: Five Year Corporate Plan 1996–2000*, Port Moresby.

Cocoa Board (1997), ... *A Brief on the Present State of the Cocoa Industry in Papua New Guinea*, Madang.

Cole-Adams, P. (2000), .. 'Three sacked after tense week in PNG', *Sydney Morning Herald,* 10 March, 11.

Coulter, H. (1992), ... 'The future role of marketing authorities in the South Pacific: assessment', in E. Fleming and H. Coulter (eds), *Agricultural Export Marketing in the South Pacific: The Future Role of Marketing Authorities*, Pacific Policy Paper 8, National Centre for Development Studies, Canberra, 36–44.

Coulter, H.K. (1996), ... *A Review of the Cocoa Export Marketing Sector,* Cocoa Board of Papua New Guinea, Madang.

CRAC (1997), ... Coffee systems research progress report for CRAC, 23–24 April 1997, Highlands Agricultural Experimental Station, Aiyura.

DAL (1992), ... *Smallholders Market Access and Food Supply Project,* Department of Agriculture and Livestock, Konedobu.

DAL (1994), ... *Agriculture Strategy Volume 1,* Department of Agriculture and Livestock, Konedobu.

DAL (1995a), ... *The Medium Term Development Strategy for the Agricultural Sub-Sector: 1995–2000 and Beyond,* Department of Agriculture and Livestock, Konedobu.

DAL (1995b), ... *Agriculture Sector Overview,* Ministerial brief, Department of Agriculture and Livestock, Konedobu.

DAL (1996a), ... Research programme of National Agricultural Research Institute: a framework, Paper presented to the International Consultation on the Establishment of National Agricultural Research Institute in Papua New Guinea, Port Moresby, June.

DAL (1996b), ... Strategic plan for the development of National Agricultural Research Institute, Paper presented to the International Consultation on the Establishment of National Agricultural Research Institute in Papua New Guinea, Port Moresby, June.

Degemba, J.Y. and
Fleming, E. (1999), ... *Economics of Grading for Smallholder Coffee Quality in Papua New Guinea,* Occasional Paper 5, ACIAR Tree Crops Policy Options Project, University of New England, Armidale.

Demirgüç, A. and Detragiache, E. (1998), .. 'Financial liberalization and financial fragility', in B. Pleskovic and J.E. Stiglitz (eds), *Annual World Bank Conference on Development Economics 1998*, World Bank, Washington, D.C., 303–331.

Department of Finance (1997), ... *1998 Supply Bills and Revenue Reforms*, Waigani.

Department of Transport (1992), ... *White Paper on Transport Infrastructure Development Plan: Sea and Road (Part II)*, Port Moresby.

DPI (1986), ... *Handbook on Agricultural Statistics 1984*, Rural Statistics Section, Policy and Planning Division, Department of Primary Industry, Konedobu.

Duncan, R. and Temu, I. (1995), ... 'The need for fiscal discipline', *Pacific Economic Bulletin* 10(1), 14–23.

Duncan, R., Warner, B. and Temu, I. (1995), ... *Papua New Guinea: Improving the Investment Climate*, International Development Issues No. 39, Australian Agency for International Development, Canberra.

Economic Insights (1994), *Papua New Guinea: The Role of Government in Economic Development*, International Development Issues No. 33, Australian International Development Assistance Bureau, Canberra.

Economic Insights (1996), *The Economy of Papua New Guinea: 1996 Report*, International Development Issues No. 46, Australian Agency for International Development, Canberra.

Economic Insights (1998), *Papua New Guinea: Coping with Shocks and Achieving Broad-Based Economic Development*, International Development Issues No. 52, Australian Agency for International Development, Canberra.

Elek, A. (1995), ... 'Book review of John Fallon, Tim King and John Zeitsch, Exchange rate policy in Papua New Guinea', *Pacific Economic Bulletin* 10(1), 147–150.

Ellingson, D. and Burnett, D. (1998), ... *Review of Oil Palm Fresh Fruit Bunch Pricing Formula*, Oil Palm Industry Corporation, Port Moresby (draft).

Etherington, D.M. and Carrad, B. (1984), ... 'The appropriate scale for South Pacific agriculture: some evidence from Papua New Guinea and Solomon Islands', in D. Gupta and S. Polume (eds), *Economic Policy Issues and Options in Papua New Guinea*, Working Paper No. 41, Development Studies Centre, Australian National University, Canberra, 85–102.

EU Commission (1996), . *Annual Report on the Stabex Funding*, European Union Commission, Brussels.

Eyzaguirre, P.B. (1996), .. *Agriculture and Environmental Research in Small Countries: Innovative Approaches to Strategic Planning*, Wiley, Chichester.

Fairbairn, T.I. (1993), ... 'Recent developments', in AIDAB (ed.), *The Papua New Guinea Economy: Prospects for Sectoral Development and Broad Based Growth*, International Development Issues No. 30, Australian International Development Assistance Bureau, Canberra, Ch. 1.

Fallon, J. (1992), ... *The Papua New Guinea Economy: Prospects for Recovery, Reform and Sustained Growth*, Australian International Development Assistance Bureau, Canberra.

Fallon, J. and Karabalis, C. (1992), ... 'Current economic trends in the South Pacific', *Pacific Economic Bulletin* 7(2), 1–18.

Fallon, J., King, T. and Zeitsch, J. (1995), ... *Exchange Rate Policy in Papua New Guinea*, Discussion Paper No. 64, Institute of National Affairs, Port Moresby.

Finlayson, M., McComb, J., Hardaker, B. and Heywood, P. (1991), ... *Commercialisation of Agriculture at Karimui, Papua New Guinea: Effects on Household Production, Consumption, and the Growth of Children*, Report of a Joint Project of the PNG Institute of Medical Research and the Department of Agricultural Economics and Business Management, University of New England, Armidale.

Fleming, E. (1992), ... 'A critical view of the case for commodity stabilization schemes in the South Pacific', in E. Fleming and H. Coulter (eds), *Agricultural Export Marketing in the South Pacific: The Future Role of Marketing Authorities*, Pacific Policy Paper 8, National Centre for Development Studies, Ch. 6.

Fleming, E. (1996), ... *Research Options for High-Value Agricultural Exports in South Pacific Island Nations*, Research Report 10, International Service for National Agricultural Research, The Hague.

Fleming, E. (1999a), ... *Palm Oil Supply Responsiveness to Price and Exchange Rate in Papua New Guinea*, Occasional Paper 4, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Fleming, E. (1999b), ... *Copra Supply Responsiveness to Price and Exchange Rate in Papua New Guinea*, Occasional Paper 6, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Fleming, E. (1999c), ... *Estimates of Planted Areas and their Development Costs, Yields, Export Prices and Volumes, Exchange Rates and Price Support in the Tree Crop Industries in Papua New Guinea*, Occasional Paper 12, ACIAR Tree Crops Policy Options Project, University of New England, Armidale.

Fleming, E. (1999d), ... *The Challenge to Improve Saving Facilities to Increase and Stabilise the Income and Consumption Levels of Tree Crop Smallholders in Papua New Guinea*, Occasional Paper 15, ACIAR Tree Crops Policy Options Project, University of New England, Armidale.

Fleming, E. (1999e), ... *Assessment of the Impact of Policy Options on Profitability in the Tree Crop Industries in Papua New Guinea*, Occasional Paper 17, ACIAR Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Fleming, E. (1999f), ... *Economic Data and Research Needs for Improved Policy Making in the Tree Crop Industries in Papua New Guinea*, Occasional Paper 20, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Fleming, E. and Antony, G. (1993), ... *The Coffee Economy in Papua New Guinea: Analysis and Prospects,* Institute of National Affairs, Port Moresby.

Fleming, E. and Milne, M. (1999), ... *An Exposition of Simulation Modelling of the Production and Export of Coffee, Cocoa, Copra and Palm Oil in Papua New Guinea,* Occasional Paper 10, ACIAR Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Fleming, E. and Piggott, R. (1989), ... 'Assessment of the policy options for agricultural stabilisation in the South Pacific', *Journal of Developing Areas* 23(2), 271–90.

Fleming, E. and Yala, C. (1999), ... *An Assessment of Policy Options for the Tree Crops in Papua New Guinea*, National Research Institute, Waigani.

Food Management Division (1995), ... *Review of DAL Marketed Fruit and Vegetable Programme,* Department of Agriculture and Livestock, Konedobu.

Gani, A. (1997), ... 'Economic growth in Papua New Guinea: some empirical evidence', *Pacific Economic Bulletin* 12(1), 41–52.

Garnaut, R. (1991), ... 'Exchange rate regimes in the Asian-Pacific region', *Asian-Pacific Economic Literature* 5(1), 5–26.

Garnaut, R. (1995), ... 'Monetary stability or more devaluation?', *Pacific Economic Bulletin* 10(1), 19–23.

Garnaut, R. and Baxter, P. (1983), ... *Exchange Rate and Macroeconomic Policy in Independent Papua New Guinea*, Department of Finance, Port Moresby.

Gerritsen, R. (1975), ... Aspects of the political evolution of rural Papua New Guinea, Unpublished paper, Research School of Social Sciences, Australian National University, Canberra.

Ghodake, R.D., Cook, K.E., Kurika, L., Ling, G., Moxon, J.E. and Nevenimo, T. (1995), ... *A Rapid Rural Appraisal of the Cocoa and Coconut Based Farming Systems in the North East Lowlands of the Gazelle Peninsula of East New Britain Province,* Technical Report No. 95/1, Department of Agriculture and Livestock, Konedobu.

Ghodake, R.D., Gaupu, B., Guman, K., Simin, A. and Kanua, M.B. (1995), ... *Intercropping of Coffee in the Highlands of Papua New Guinea,* Technical Report No. 95/2, Department of Agriculture and Livestock, Konedobu.

Gibson, J. (n.d.), ... A note on the potential for honey production to stabilise cash income in the Highlands of Papua New Guinea, Unpublished paper, Food Research Institute, Stanford University.

Gibson, J. (1994), ... 'The price elasticity of demand for Papua New Guinea exports of cocoa and coffee', *Papua New Guinea Journal of Agriculture, Forestry and Fisheries* 37(2), 67–75.

Gibson, J. and Rozelle, S. (1998), ... Results of the household survey component of the 1996 Poverty Assessment for Papua New Guinea, Unpublished paper, Population and Human Resources Division, World Bank, Washington, D.C.

Giddings, R. (1981), ... 'Beyond the land court: dispute settlement or land distribution', in J. Knetsch and M. Trebilcock (eds), *Land Policy and Economic Development in Papua New Guinea,* Institute of National Affairs, Port Moresby.

Gilbert, C.L. (1993), ... 'Domestic price stabilisation schemes in developing countries', in S. Claessens and R.C. Duncan (eds) (1993), *Managing Commodity Price Risk in Developing Countries,* Johns Hopkins University Press, Baltimore, Ch. 2.

Gillbanks, R. (1992), ... A note in relation to 'Rehearsing for the Future', Unpublished letter to the Director of the Institute of National Affairs, Rabaul.

Gimbol, K.C. (1992), ... 'Cocoa stabilization in Papua New Guinea: approaches and issues', in E. Fleming and H. Coulter (eds), *Agricultural Export Marketing in the South Pacific: The Future Role of Marketing Authorities*, Pacific Policy Paper 8, National Centre for Development Studies, Ch. 11.

Gimbol, K.C., Battese, G.E. and Fleming, E.M. (1995), 'Technical efficiencies of smallholder cocoa producers in Papua New Guinea: a stochastic frontier analysis', *Quarterly Journal of International Agriculture* 34(4), 337–357.

Godden, K. (1980), ... 'Coffee theft in the mid Wahgi area of the Western Highlands Province', in *A Report on the Coffee Industry Workshop*, Papua New Guinea Coffee Industry Board, Goroka, 24–27.

Godoy, R. and Bennett, C.P.A. (1991), ... 'The economics of monocropping and intercropping by smallholders: the case of coconuts in Indonesia', *Human Ecology* 19(1), 83–98.

Good, K. and Donaldson, M. (1977), .. *The Development of Rural Capitalism in Papua New Guinea: Coffee Production in the Eastern Highlands*, History of Agriculture Discussion Paper No. 29, University of Papua New Guinea and Department of Primary Industry, Konedobu.

Grey, M. (1993), ... 'Agriculture: problems and prospects', in AIDAB (ed.), *The Papua New Guinea Economy: Prospects for Sectoral Development and Broad Based Growth*, International Development Issues No. 30, Australian International Development Assistance Bureau, Canberra, Ch. 4.

Grossman, L.S. (1984), .. *Subsistence, Ecology and Development in the Highlands of Papua New Guinea*, Princeton University Press.

Guest, J. (1989), ... *The Cocoa, Coffee and Copra Price Stabilisation Schemes in Papua New Guinea's Post-Independence Macroeconomic Policy Framework*, ACIAR Working Paper No. 28, Australian Centre for International Agricultural Research, Canberra.

Gumoi, T.M. (1992), ... An ex-post evaluation of the effectiveness and relevance of the commodity price stabilisation schemes in Papua New Guinea, M. Ec. dissertation, University of New England, Armidale.

Gumoi, T.M. (1994), ... 'The role of price subsidies in agriculture in Papua New Guinea', *Papua New Guinea Journal of Agriculture, Forestry and Fisheries* 37(1), 84–91.

Gwilliam, K. and Shalizi, Z. (1999), ... 'Road funds, user charges, and taxes', *World Bank Research Observer* 14(2), 159–185.

Harding, P.E., Bleeker, P. and Freyne, D.F. (1987), . *Land Suitability Evaluation for Rainfed Arabica Coffee Production: Western Highlands Province, Papua New Guinea*, Coffee Research Report No. 4, PNG Coffee Research Institute, Aiyura.

Harris, G.T. and Williams, L.R. (1980), ... 'Village-oriented training: an alternative form of agriculture extension for Papua New Guinea', *Yagl-Ambu* 7(1).

Hassall and Associates (1982), ... *Review of the Papua New Guinea Coffee Marketing System: Final Report*, Papua New Guinea Coffee Industry Board, Goroka.

Hassall and Associates (1997), ... *Establishment of an Instant Coffee Factory in Papua New Guinea*, Report prepared for the Investment Promotion Authority, Port Moresby.

Hazell, P.B.R. (1992), ... 'Appropriate role of agricultural insurance in developing countries', *Journal of International Development* 4(6), 567–581.

Hertel, T.W. (1990), ... 'General equilibrium analysis of U.S. agriculture: what does it contribute?', *Journal of Agricultural Economics Research* 42(3).

Howlett, D., Hide, R. and Young, E. (1976), ... *Chimbu: Issues in Development*, Monograph No. 4, Development Studies Centre, Canberra.

Hughes-Hallett, A.J. and Ramanujam, P. (1990), ... *Marketing Solutions to the Problem of Stabilizing Commodity Earnings*, CEPR Working Paper 48, Centre for Economic Policy Research, London.

ICCO (1990), ... *Comparison of Cocoa Production Costs in Seven Producing Countries*, International Cocoa Organization, London.

ICCO (2001), ... Daily prices of cocoa beans, at www.icco.org/prices/010419.htm.

ICO (2001), ... Indicator prices April 2001, at www.ico.org/prices/statist/pr.htm.

IMF (1999), ... *International Financial Statistics* (and previous issues), International Monetary Fund, Washington, D.C.

INA (1994), ... *Papua New Guinea Private Sector: 1993 Survey of Trends, Concerns and Prospects*, Institute of National Affairs, Port Moresby.

Institute of Marketing and Research (1992), ... Why has agricultural growth fallen behind population growth?, Unpublished consultancy report, Alotau.

ISNAR (1982), ... *Review of the Program and Organization for Crops Research in Papua New Guinea*, International Service for National Agricultural Research, The Hague.

Ivarami, M. and Yarbro, S. (1992), ... 'Cocoa grading and quality control in Papua New Guinea', in E. Fleming and H. Coulter (eds), *Agricultural Export Marketing in the South Pacific: The Future Role of Marketing Authorities*, Pacific Policy Paper 8, Australian National University, Canberra.

Jarrett, F.G. (1985), ... *Innovation in Papua New Guinea Agriculture*, Institute of National Affairs, Port Moresby.

Jarrett, F.G. (1990), ... *Papua New Guinea: Economic Situation and Outlook*, Australian International Development Assistance Bureau, Canberra.

Jarrett, F.G. and Anderson, K. (1989), ... *Growth, Structural Change and Economic Policy in Papua New Guinea: Implications for Agriculture*, National Centre for Development Studies, Canberra.

Johnson, P.L. (1988), ... 'Women and development: a Highland New Guinea example', *Human Ecology* 16(2), 105–122.

Jolly, L., Beck, A. and Bodman, P. (1990), ... *Commodity Price Stabilisation in Papua New Guinea*, ABARE Discussion Paper 90.2, Australian Government Publishing Service, Canberra.

Judd, M.A., Boyce, J.K. and Evenson, R.E. (1986), 'Investing in agricultural supply: the determinants of agricultural research and extension investment', *Economic Development and Cultural Change* 35(1), 77–144.

Kannapiran, C. (1993), .. *Privatization under Agricultural Sector in Papua New Guinea: Issues and Options*, Policy Discussion Paper, Department of Agriculture and Livestock, Konedobu.

Kannapiran, C. (1995), .. *Institutional Rural Finance in PNG: Lessons from the Failures and Need for Reforms*, National Research Institute, Boroko.

Kannapiran, C. (1999a), . *An Econometric Model of Papua New Guinea: Basis for Analysing the Impact of Variability in Tree Crop Export Revenue on the Economy*, Occasional Paper 1, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Kannapiran, C.A. (1999b), Analysis of the Impact of Variability in Tree Crop Export Revenue and Stabilisation Measures on the Macroeconomy in Papua New Guinea, Occasional Paper 11, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Kannapiran, C. (1999c), . Economic Efficiency of Tree Crop Exports in Papua New Guinea: An Empirical Study of Competitiveness and Comparative Advantage, Occasional Paper 2, ACIAR Tree Crop Policy Options Project, University of New England, Armidale.

Kannapiran, C. (1999d), . Analyses of economic efficiency and macroeconomic impacts of export fluctuations and price policy in the tree crops industries in Papua New Guinea, PhD thesis, University of New England, Armidale.

Kannapiran, C. and Wosae, C. (1995), ... 'Floating exchange rate and sinking kina value', *Current Issues (National Research Institute of PNG)* 3(2), 28-31.

King, T. and Sugden, C. (1997), ... 'Managing Papua New Guinea's kina', *Pacific Economic Bulletin* 12(1), 20–29.

Knudsen, O. and Nash, J. (1986), ... Lessons from price stabilization schemes in developing countries, Background paper to World Development Report 1986, World Bank, Washington, D.C.

Kohls, R.L. and Uhl, J.N. (1980), ... *Marketing of Agricultural Products*, 5th edn, Macmillan, New York.

Kufinale, K. (1994), ... *The Case of Catimor in Papua New Guinea,* Coffee Discussion Paper No. 17, Industry Affairs Division, Coffee Industry Corporation, Goroka.

Kuimbakul, T. (1994), ... *Coffee Report No. 32*, Industry Affairs Division, Coffee Industry Corporation, Goroka.

Kuimbakul, T. (1996), ... *Coffee Report No. 37*, Industry Affairs Division, Coffee Industry Corporation, Goroka.

Kuimbakul, T. and Gilling, J. (1989), ... *The Okapa/Wonenara Project Area Economy and Agricultural Marketing*, Policy and Planning Division, Department of Agriculture and Livestock, Konedobu.

Lakau, A.A.L. (1985), ... 'Land policies and practices to independence', *Yagl-Ambu* 12(1), 104–114.

Lam, N. (1984), ... *The Commodity Export Sector in Papua New Guinea,* Monograph No. 22, Institute of Applied Social and Economic Research, Boroko.

Larson, D.F., Varangis, P. and Yabuki, N. (1998), ... *Commodity Risk Management and Development*, Policy Research Working Paper 1963, World Bank, Washington, D.C.

Lea, D.A.M. and Crittenden, R. (1988), ... *Provincial Integrated Rural Development Programmes in Papua New Guinea: A Decade of Experience*, Discussion Paper No. 58, Institute of Applied Social and Economic Research, Boroko.

Leahy, P.J. (1980), ... 'Coffee Industry Board and general industrial problems', in *A Report on the Coffee Industry Workshop*, Papua New Guinea Coffee Industry Board, Goroka, 34–39.

Leechor, C. (1995), ... 'Fiscal relations and service delivery', *Pacific Economic Bulletin* 10(1), 31–39.

Levantis, T. (1997), ... 'The urban market in Papua New Guinea, post-deregulation', *Pacific Economic Bulletin* 12(2), 54–72.

Levantis, T. and Gani, A. (1998), ... 'Labour market deregulation, crime and Papua New Guinea's severe drought', *Pacific Economic Bulletin* 13(1), 89–97.

Lieberman, S. and Heywood, P. (1995), ... 'Health services: a review and remedial strategies', *Pacific Economic Bulletin* 10(1), 95–100.

Livingstone, I. (1989), ... *The Marketing of Cocoa and Copra in Papua New Guinea*, Discussion Paper No. 37, Institute of National Affairs, Port Moresby.

Loayza, N., Schmidt-Hebbel, K. and Servén, L. (1998), ... What drives savings across the world? [www.worldbank.org/research/projects/savings/trnsition.htm].

Macrae, J. and Vele, M. (1981), ... *Roads, Electrification, Cash Cropping and Economic Impact*, Institute of Applied Social and Economic Research, Boroko.

MacWilliam, S. (1991), . . . 'Smallholder production, the state and land tenure', in P. Larmour (ed.), *Customary Land Tenure: Registration and Decentralisation in Papua New Guinea,* Monograph No. 29, Institute of Applied Social and Economic Research, Boroko.

MacWilliam, S. (1995), . . . 'Unemployment, order and commodity stabilisation funds', *Pacific Economic Bulletin* 10(1), 24–30.

McConaghy, C.D. (1985), . 'The coffee industry in the Papua New Guinea economy', in *Issues in Agricultural Policy: Papers Submitted at INA Agricultural Seminars,* Institute of National Affairs, Port Moresby, 60–67.

McConnell, C., Rambaldi, A. and Fleming, E. (1999), . . . *An Empirical Test of the Proposition that the Quality of Coffee Exports in Papua New Guinea has Declined,* Occasional Paper 8, Tree Crops Policy Options Project in Papua New Guinea, University of New England, Armidale.

McGavin, P.A. (1993), ... 'The 1992 Minimum Wages Board determination: implications for employment and growth', in AIDAB (ed.), *The Papua New Guinea Economy: Prospects for Sectoral Development and Broad Based Growth,* Australian International Development Assistance Bureau, Canberra, Ch. 3.

McKillop, R.F. (1982), ... *DPI Manpower and Training Review,* McKillop Williamson and Associates, Port Moresby.

McLaren, P. (1999), ... *Analysis of the Effects of Pruning and Intercropping on Profitability on Coffee Farms in Papua New Guinea,* Occasional Paper 14, ACIAR Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

McLaren, P. and Fleming, E. (1999), ... *Coffee Supply Responsiveness to Price and Exchange Rate in Papua New Guinea,* Occasional Paper 3, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Manning, M. (1998), ... 'Monetary policy in Papua New Guinea: a critical analysis', *Pacific Economic Bulletin* 13(2), 17–28.

Mawuli, A. and Yala, C. (1995), ... 'Promoting small business and micro-enterprises', *Pacific Economic Bulletin* 10(1), 55–65.

Mellor, C. (1998), ... 'Recurrent cost financing: an overview', *Pacific Economic Bulletin* 13(2), 137–143.

Milne, M., Coelli, T. and Fleming, E. (1999), .. *Estimation of the Planting Response of Cocoa Producers in Papua New Guinea Using a State-Space Model,* Occasional Paper 16, ACIAR Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Milne, M. and Fleming, E. (1999), ... *A Review of Economic Policies and their Impact on the Tree Crops Sub-Sector in Papua New Guinea,* Occasional Paper 13, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Ministry of Finance and Planning (1992), ... *1993 Budget, Volume 1, Economic and Development Policies*, Port Moresby.

Mitio, R.M. (1990), ... 'An information paper on the Coffee Industry Corporation: a model for efficient management of export tree crop industries', *PNG Coffee Research Institute Newsletter* 1, 38–43.

Mitio, R. and Smith, D. (1991), ... 'Tax and specific sectors(coffee industry', in *PNG Tax Summit, 1991*, Discussion Paper No. 50, Institute of National Affairs, Port Moresby.

Montiel, P.J. (1994), ... 'Capital mobility in developing countries: some measurement issues and empirical estimates', *World Bank Economic Review* 8(3), 311–350.

Mwesigye, D. (1989), ... 'Evaluation of benefits to smallholders and estates of coffee price stabilisation in Papua New Guinea', Paper 5 in E.M. Fleming (ed.), *The Economics of Smallholder Tree Crop Production in Melanesia: Selected Case Studies,* South Pacific Smallholder Project, University of New England, Armidale.

NCDS (1995), ... *South Pacific Economic and Social Database: Papua New Guinea Statistical Compendium*, National Centre for Development Studies, Canberra.

Newton, J. (1985), ... *Oraikaiva: Production and Change*, Pacific Research Monograph No. 11, Development Studies Centre, Australian National University, Canberra.

Nihill, M. (1991), ... 'Money and "moka": men, women, and change in Anganen mortuary exchange', *Journal of the Polynesian Society* 100(1), 45–69.

NSO (1979), ... *Summary of Statistics 1979* (and previous issues, published by the Bureau of Statistics to 1977), National Statistical Office, Port Moresby.

Omuru, E., Nailina, R. and Fleming, E. (2001), .. *A Socioeconomic Baseline Survey of Cocoa and Copra Smallholders in East New Britain*, Occasional Paper 1, Understanding the Smallholder Cocoa and Coconut Sector in Papua New Guinea, Cocoa and Coconut Research Institute/University of New England, Keravat and Armidale.

Onchoke, S.N. (1996), .. An economic analysis of commodity export revenue and variability in the South Pacific island nations, PhD thesis, University of New England, Armidale.

Opa, M. (1991), ... Commodity stabilisation funds and minimum price assistance in Papua New Guinea: a review of issues, Paper presented at a Seminar on Agricultural Development in PNG: Policy Issues and Options, Waigani, December.

OPIC (1996), ... Plantings and production of estate/milling companies and smallholders, Unpublished paper, Oil Palm Industry Corporation, Port Moresby.

Overfield, D. (1991a), ... *Coffee Price Stabilisation Review and Policy Proposals*, Coffee Discussion Paper No. 5, PNG Coffee Industry Board, Goroka.

Overfield, D. (1991b), ... *The Economics of Smallholder Coffee Production: Analysis, Policy and Future Research Directions*, Coffee Discussion Paper No. 6, PNG Coffee Industry Board, Goroka.

Overfield, D. (1994), ... *The Smallholder Coffee System: Production Costs, Grower Returns and Economic Sustainability,* Discussion Paper No. 15, Industry Affairs Division, Coffee Industry Corporation, Goroka.

Overfield, D. (1995), ... The economics of social subordination: gender relations and market failure in the Highlands of Papua New Guinea, Ph. D. thesis, University of Leeds.

Overfield, D. (1997), ... 'Smallholder coffee farming systems in Papua New Guinea: household objectives and constraints to development', in E. Fleming and B. Hardaker (eds), *Strategic Issues in the Economic Development of Melanesian Agriculture,* National Centre for Development Studies, Canberra.

Overfield, D. and Fleming, E. (1999), ... *The Technical Efficiency of Smallholder Coffee Producers in Papua New Guinea: Implications for Research & Extension,* Occasional Paper 7, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Overfield, D. and Fleming, E. (2000), ... Analysis of the technical efficiency of food crop production in a sweet potato/coffee-based farming system in the Highlands of Papua New Guinea, Paper to be presented to the 12th Symposium of the International Society for Tropical Root Crops, Tsukuba, 10–16 September.

Overfield, D. and Irog, L. (1992), ... *Smallholder Research and Monitoring: Methodological Considerations and Preliminary Results,* Coffee Discussion Paper No. 8, Coffee Industry Corporation, Goroka.

Overfield, D. and Kufinale, K. (1993), ... *An Economic Assessment of Coffee Research Industry Dynamics and Research Priorities,* Coffee Discussion Paper No. 14, Coffee Industry Corporation, Goroka.

Perkins, F. (1994), ... *Practical Cost Benefit Analysis: Basic Concepts and Applications,* Macmillan, Melbourne.

Peter, R. (1996), ... *Cocoa Statistics of Papua New Guinea,* Cocoa Board, Madang.

Peter, R. (1997), ... *Papua New Guinea Cocoa Market Report: April–June 1997*, Cocoa Board, Madang.

Pindyck, R.S. and Rotemberg, J.J. (1990), ... 'The excess co-movement of commodity prices', *Economic Journal* 100, 1173–1189.

Pragma Corporation (1991), ... *Comparative Advantage Study of Selected Industrial Crops in Asia*, Report to the Asian Development Bank, Manila.

QDPI/DAL/CIB (1987), .. *Papua New Guinea Export Tree Crop Study: Volume 1— Largeholder Coffee*, Queensland Department of Primary Industries and Papua New Guinea Department of Agriculture and Livestock, Brisbane and Port Moresby.

Reay, M. (1982), ... 'Lawlessness in the Papua New Guinea Highlands', in R.J. May and H. Nelson (eds), *Melanesia: Beyond Diversity*, Research School of Pacific Studies, Australian National University, 623-637.

Reynoso, A. (1988), ... Financial liberalization and the interest rate elasticity of savings in developing countries, PhD thesis, Massachusetts Institute of Technology, Cambridge, Mass.

Ruf, F. (1995), ... 'From "forest rent" to "tree capital": basic "laws" of cocoa supply', in F. Ruf and P.S. Siswoputranto (eds), *Cocoa Cycles: The Economics of Cocoa Supply*, Woodhead, Cambridge, Ch. 1.

Ruhle, J. and Fleming, E. (1999), ... *Cocoa Supply Responsiveness to Price and Exchange Rate in Papua New Guinea*, Occasional Paper 9, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Ruthenberg, H. (1980), .. *Farming Systems in the Tropics*, 3rd edn, Clarendon Press, Oxford.

Sampson, H.C. (1923), ... *The Coconut Palm: The Science and Practice of Coconut Cultivation*, Bale Sons and Danielson, London.

Schmidt-Hebbel, K., Servén, L. and Solimano, A. (1996), . 'Saving and investment: paradigms, puzzles, policies', *World Bank Research Observer* 11(1), 87-117.

Setae, M. (1994), ... 'Delivery of agricultural services in PNG: strategies and options towards the next decade', *Papua New Guinea Journal of Agriculture, Forestry and Fisheries* 37(1), 19–24.

Shaw, B. (1985), ... *Agriculture in the Papua New Guinea Economy,* Discussion Paper No. 20, Institute of National Affairs, Port Moresby.

Simmons, R. and Anoser, K. (1993), ... *Copra Marketing Margins in Papua New Guinea,* Policy Working Paper No. 6, Programming, Planning and Budgeting Division, Department of Agriculture and Livestock, Konedobu.

Simmons, R. and Yarbro, S. (1993), ... *Cocoa Marketing Margins and the Distribution of the Bounty to Growers,* Policy Working Paper No. 4, Programming, Planning and Budgeting Division, Department of Agriculture and Livestock, Konedobu.

Sitapai, E.C., Wayi, B.M. and Ghodake, R.D. (1994), 'The Papua New Guinea national agricultural research system: its policy framework and development perspective', *Papua New Guinea Journal of Agriculture, Forestry and Fisheries* 37(1), 32–40.

Smith, D.G.V. (1992), ... *Coffee Report No. 26,* Coffee Industry Corporation, Goroka.

SRI International (1990), . *Papua New Guinea Commodity Stabilisation Study,* Report prepared for the Asian Development Bank, Manila.

Stapleton, G. (1998), ... *1997 Exporter Costs Study,* Coffee Discussion Paper No. 22, Coffee Industry Corporation, Goroka.

Stapleton, G., Alu, M. and Wheeler, M. (1999), . *Coffee Report No. 45,* Industry Affairs Division, Coffee Industry Corporation, Goroka.

Stein, L. (1991), ... *Papua New Guinea: Economic Situation and Outlook,* International Development Issues No. 16, Australian International Development Assistance Bureau, Canberra.

Temon, B. (1990), ... *Road-Side Price Movements and Marketing Efficiency in Selected Areas in Western Highlands Province, Papua New Guinea, February 1989/January 1990*, Working Paper No. 5, Designing Monitoring Systems for Smallholder Agriculture in Papua New Guinea, Department of Human Geography, Australian National University, Canberra.

Temon, B. (1991), ... *Statistical Report: 1990/91 Coffee Year*, Papua New Guinea Coffee Industry Board, Goroka.

Thac, C.D. and im, D. (1984), ... 'Papua New Guinea's tax performance, 1969–1977', *World Development* 12(4), 451–459.

Tietenberg, T. (1992), ... *Environmental and Natural Resource Economics*, 3rd edn, Harper Collins, New York.

Trewin, R., Menz, K. and Grist, P. (1998), ... 'Costs and benefits of land uses in the Indonesian uplands: estimates using linked biological and economic models, in J. Gooday (ed.), *Proceedings of the Bioeconomics Workshop*, Armidale, January.

Turtle, C. (1991), ... 'Administrative reform and land mobilisation', in P. Larmour (ed.), *Customary Land Tenure: Registration and Decentralisation in Papua New Guinea*, Monograph No. 29, Institute of Applied Social and Economic Research, Boroko.

Uppal, J.S. (1994), ... *Agricultural Taxation in Papua New Guinea*, Institute of National Affairs, Port Moresby.

USDA (1993), ... *World Coffee Situation—Coffee*: ICO Composite Indicator Prices, Circular Series FCOF 1-93, United States Department of Agriculture, Washington, D.C.

Vandermeer, J.H. (1990), . 'Intercropping', in C.R. Carroll, J.H. Vandermeer and P.M. Rosset (eds), *Agroecology, McGraw-Hill*, New York, 481–515.

Warr, P.G. (1992), ... *Comparative and Competitive Advantage in Manufactured Exports*, EDI Working Papers, Economic Development Institute, World Bank, Washington, D.C.

Wheeler, M.A. (1980), ... 'Roadside coffee buying', in *A Report on the Coffee Industry Workshop,* Papua New Guinea Coffee Industry Board, Goroka, 20–23.

Wheeler, M.A. (1982), .. 'Some comments on the role and scope of Coffee Board funded research', *Coffee Industry Board Research Newsletter* 2(1).

Wheeler, M.A. and Wyatt, S.L. (1978), ... *Agricultural Stabilisation Funds in Papua New Guinea: The Case of Coffee and Cocoa*, Department of Primary Industry, Port Moresby.

Whitehead, A. (1981), ... 'I'm hungry Mum: the politics of domestic budgeting', in K. Young, C. Wolkowitz and S. McCullagh (eds), *Of Marriage and the Market: Women's Subordination and its Lessons*, Routledge and Kegan Paul, London.

Wilson, L.D. and Evans, G.B.A. (1975), ... *Sample Survey of Smallholder Coffee Producers,* Economics and Marketing, Department of Agriculture, Stock and Fisheries, Konedobu.

Woldekidan, B. (1994), .. *Short-Term Economic Consequences of Devaluing the Kina: A General Equilibrium Analysis for Papua New Guinea*, NRI Special Publication No. 19, National Research Institute, Boroko.

World Bank (1980), ... *Impact Evaluation Report(Papua New Guinea: New Britain Smallholder Development Projects*, Operations and Evaluation Department, World Bank, Washington, D.C.

World Bank (1984), ... *Price Prospects for Major Primary Commodities*, Volume 2, Washington, D.C.

World Bank (1988), ... *Papua New Guinea Agricultural Assessment Review* (2 volumes), Washington, D.C.

World Bank (1992), ... *Papua New Guinea: Revitalizing Agriculture-Issues and Options*, Washington, D.C.

World Bank (1994), ... *Papua New Guinea: Restructuring for Broad-Based Development Opportunities and Challenges,* Report No. 12982-PNG, Washington, D.C.

World Bank (1995), ... *Economic Recovery Program (ERP) Loan Document 1995: The Independent State of PNG*, Washington, D.C.

World Bank (1997), ... *Papua New Guinea—Accelerating Agricultural Growth: An Action Plan*, Washington, D.C.

World Bank (1999),' .... Why do savings rates vary across countries?', *World Bank Policy and Research Bulletin*, January-March, 1–4.

Yala, C. and
Levantis, T. (1998), ... 'Recent events in Papua New Guinea: a continuing drought in development', *Pacific Economic Bulletin* 13(2), 1–16.

Yala, C., Igitoi, J. and
Lummani, J. (1999), ... *A Survey of the Impacts of Market Accessibility on the Behaviour of Smallholders and Buyers in Oil Palm Projects and Coffee-Producing Areas of Papua New Guinea*, Occasional Paper 18, Tree Crop Policy Options Project in Papua New Guinea, University of New England, Armidale.

Yarbro, S. (1988), ... Cocoa marketing in Papua New Guinea, Paper presented to an Agricultural Marketing Seminar, sponsored by the Economic Development Institute and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture, Yogyakarta, 1–6 August.

Yarbro, S. (1992), ... Domestic marketing of coconut products in Papua New Guinea, Paper presented to the Asia and Pacific Coconut Community, Cocoa and Coconut Research Institute, Rabaul.

Yarbro, S. and
Noble, S. (1989), ... *Smallholder Production, Processing and Marketing of Cocoa and Copra in Papua New Guinea: A Baseline Survey*, Working Paper 10, ACIAR Project 8734, Australian Centre for International Agricultural Research, Canberra.

Yudelman, M. (1985), ... *The World Bank & Agricultural Development: An Insider's View*, WRI Working Paper No. 1, World Bank, Washington, D.C.

Zeitsch, J., Fallon, J.
and Welsh, A. (1993), ... *Estimating the Benefits from Certain Structural Reforms in the Papua New Guinean Economy*, Working Paper 93/5, Economics Division, Research School of Pacific Studies, Australian National University, Canberra.