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Solomon Islands Smallholder Agriculture Study

Volume 1

Main Findings and Recommendations



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Acronyms

ACIAR	Australian Centre for International Agricultural Research	NPV	net present value
ADB	Asian Development Bank	OBM	outboard motor (powered canoes)
ATC	Agricultural Training Centre	PFN	People First Network
AusAID	Australian Agency for International Development	PIC	Pacific Island country
B	benefits	PNG	Papua New Guinea
C	costs	r(i)	rate of interest
CEMA	Commodities Export Marketing Authority	RTC	rural training centre
CPRF	Community Peace and Restoration Fund	SDP	Smallholder Development Programme
CSP	Community Sector Program	SI	Solomon Islands
DAL	Department of Agriculture and Livestock	SIARTC	Solomon Islands Association of Rural Training Centres
DME	direct micro-expeller (coconut oil mills)	SIG	Solomon Islands Government
EU	European Union	SIPL	Solomon Islands Plantation Limited
FAO	Food and Agriculture Organization of the United Nations	SPC	Secretariat of the Pacific Community
FES	Field Experiment Station	SPITIC	South Pacific Islands Trade and Investment Commission
FJD	Fiji dollar	TA	technical assistance
fob	free on board	UNDP	United Nations Development Programme
FSP	Farmers Support Programme	WIB	Women in Business — a Samoan NGO
IRR	internal rate of return		
KGA	Kastom Gaden Association		
MAFFM	Ministry of Agriculture, Forests, Fisheries and Meteorology (Samoa)		
MIS	market information system		
NGO	nongovernment organisation		

Currency convention

The currency used throughout, unless otherwise stated, is the Solomon Island Dollar (SI\$), with an exchange rate of SI\$1.00 = A\$0.20 in September 2004.



Figure 1 Map of Solomon Islands, showing the main island groups

Preface

THE SOLOMON ISLANDS SMALLHOLDER AGRICULTURE STUDY IS A SERIES OF FIVE VOLUMES WHICH DOCUMENT THE DEVELOPMENT OF RECOMMENDATIONS FOR A SET OF AGRICULTURAL INTERVENTIONS SUPPORTING BOTH SUBSISTENCE AGRICULTURE AND INCOME-GENERATING ACTIVITIES FOR RURAL COMMUNITIES IN SOLOMON ISLANDS.

It presents recommendations for the implementation of the study findings, as well as some of the background research that provides the rationale for their development.

The series is based on studies in SI from September to November 2004. The 13-person study team (see Appendix 1.2 for member biographies) consisted of: Matthew Allen, Mike Bourke (co-leader), Barry Evans, Ellen Iramu, Roselyn Kabu Maemouri, Andrew McGregor, Ben Mullen, Alice Aruheeta Pollard, Morgan Wairiu, Claudine Watoto and Stav Zotalis (co-leader). AusAID staff members, Geoff Fox and Nadira Mailewa, also contributed, and Sarah Goulding guided the process. Assistance was received from many people in Solomon Islands. In particular, field staff of the AusAID-funded Community Peace and Restoration Fund (CPRF) facilitated the fieldwork in the provinces.

The studies were conducted in two phases:

- > Phase 1 involved a five-week study, which was undertaken from August to September 2004 in Brisbane, Canberra and Honiara by Barry Evans, with technical assistance from Mike Bourke and others. The report of this study has been included in this series as Volume 5, *Literature Review: A Brief National Assessment of the Agriculture Sector*.
- > Phase 2 involved a comprehensive in-country study of the agricultural sector. The study was conducted over a period of five weeks in SI from September to October 2004. The team undertook visits to seven of the nine provinces in SI, and

information on the remaining two provinces was based on interviews and information gathered during previous visits by some team members. This study was complemented by the work undertaken by Andrew McGregor (a marketing specialist) on marketing issues, which was completed in November 2004 (see Volume 3).

The smallholder agriculture study complements the work undertaken under the broader Australian program of assistance to SI, which focuses on interventions in the law and justice sector, machinery of government, economic governance, health and education sectors, and the community development sector, as well as small-scale interventions focused on promoting peace building.

Volume 1, *Main Findings and Recommendations* draws on the findings of the two-phased study to present a series of recommendations for enhancing rural livelihoods in SI, including recommendations for interventions to implement the study. Appendix 1.1 provides a cost–benefit analysis by Andrew McGregor of the proposed recommendations, which includes a detailed analysis of returns to both labour and land, as well as information on international market prices for current and potential export crops.

Volumes 2–5 contain considerable support material for the recommendations that are developed in Volume 1.

Volume 2, *Subsistence Production, Livestock and Social Analysis*, covers livestock issues (Ben Mullen), an overview of subsistence agriculture (Tony Jansen),

and gender, social and cultural issues (Alice Aruheeta Pollard).

Volume 3, *Markets and Marketing Issues*, was written by Andrew McGregor and describes the detailed marketing analyses on which Volume 1 is based. In particular, Volume 3 provides justification for the recommended interventions that are detailed in Chapter 10 of Volume 1.

Volume 4, *Provincial Reports*, comprises individual reports on the constraints and opportunities for agricultural interventions in the nine provinces. They cover: Central (Matthew Allen, principal author), Choiseul (Matthew Allen and Ben Mullen), Guadalcanal (Mike Bourke), Isabel (Morgan Wairiu), Makira (Morgan Wairiu and Ben Mullen), Malaita (Mike Bourke), Rennell and Bellona (Barry Evans), Temotu (Morgan Wairiu) and Western (Barry Evans) provinces. Each provincial report was based on four to seven days of fieldwork per province, except for Choiseul and Temotu, which were based on interviews and other sources.

Volume 5, *Literature Review: A Brief National Assessment of the Agriculture Sector*, was written by Barry Evans and gives a broad overview and assessment of information on the agriculture sector in SI.

Volume 1 of this study was sent to a number of SI and Australian Government departments, several international development organisations and two academic referees for comments and review. The Solomon Island departments consulted were: Agriculture and Livestock, the Central Bank, and National Reform and Planning. The Australian Government departments were Finance, Foreign Affairs and Trade, and Treasury. Other agencies that commented on the draft document were the Asian Development Bank, European Union, New Zealand Aid and the World Bank. One academic referee was based in Australia, the other in the United Kingdom. The comments that were received have been incorporated in the final version where possible.

Summary

THIS VOLUME DOCUMENTS THE DEVELOPMENT OF A SERIES OF RECOMMENDATIONS TO STRENGTHEN SUBSISTENCE AGRICULTURE AND PROVIDE CASH-GENERATING OPPORTUNITIES FOR THE RURAL POPULATION OF SOLOMON ISLANDS (SI).

It presents recommendations for the implementation of the study findings, based on research that is presented in detail in the accompanying reports (Volumes 2–5).

Most Solomon Islanders (84% of the population) live in rural areas, and these people derive their livelihoods from a combination of subsistence agriculture and small-scale income-generating activities, particularly export cash cropping and marketing of fresh produce. There are very limited prospects in the short to medium term for significant employment-generating opportunities outside Honiara and other urban areas. Therefore, most employment growth will have to occur in the informal sector, and be driven by agricultural production and marketing. Although the informal sector is the backbone of the SI economy, only 1% of the donor-funded development budget in 2004 was targeted towards the agricultural sector, and the current level of donor commitments for future funding is not sufficient to effectively address the constraints on improving rural livelihoods.

Interventions promoting rural livelihoods should not be limited to subsistence and smallholder agriculture alone; other areas such as artisanal fisheries and small-scale forestry are also important. However, these subsectors are not addressed here and will be the focus of analytical work to be undertaken by other key donors.

Issues reviewed in this document (and treated in detail in Volumes 2–5) include: the impact of the ethnic tension on donor activities in the agriculture sector; previous agriculture development experience and lessons learned; gender, social and cultural issues relevant to agriculture; the SI physical environment; demographic issues; and support frameworks for the agricultural sector provided by the Department of Agriculture and Livestock, nongovernment organisations, rural training centres, women’s groups, and the Commodity Export Marketing Authority. The document also reviews some of the critical constraints to agricultural production in SI, such as the inadequacy of transport infrastructure. During field visits, team members noted where repairs to existing roads and bridges or extension of the road network would make a significant difference to agricultural production and marketing, and notes on these locations are provided.

Most of the food consumed by villagers is grown in food gardens. Important sources of food that are not grown in rural gardens include coconuts, fish, other marine resources such as shellfish and mangroves, and fruit and nuts obtained from trees in the forest or in villages. Sweet potato is by far the most important source of food energy in SI and contributes an estimated 65% by weight of the locally grown staple foods. Other important food crops are cassava, banana, kongkong taro, island taro, coconut, *pana* and yam. The production of these staple food crops is estimated to be about

430 000 tonnes per year, which is conservatively valued at \$411 million per year.

A rapidly increasing population has led to considerable intensification of land use in recent decades. Extended cropping periods and consequent reduction in fallow periods have reduced crop yields. This is now becoming a major problem in some locations, and is particularly acute on north Malaita and many of the small islands. There is considerable potential to improve food production, particularly if higher yielding varieties of important foods are adopted.

Fresh food, betel nut, marine food, other animal food and firewood are significant sources of cash income for many rural villagers. The relative importance of domestic marketing of food and other items varies greatly within and between islands. It is most important for those living on the road network in North Guadalcanal and on other nearby islands where there is relatively good access to the Honiara market. The income derived from the sale of fresh food ranges from very minor and incidental to the main source of cash income. There is some potential to increase the sale of domestically marketed food in locations with relatively easy access to the Honiara market. This can be done in a number of ways, including production and sale of food species and varieties that are rarely sold at present; improved postharvest handling and marketing; safer handling of pesticides; and upgrading of physical marketplaces at a number of the minor urban centres.

Throughout the 1990s, the main agricultural export crops were copra, coconut oil, palm oil, palm kernel oil and cocoa. The oil palm plantation on the Guadalcanal Plains was closed, and its offices and mill destroyed, during the ethnic tensions in 1999. During the time the fieldwork was conducted, production had not resumed. Production of copra increased in 2003 to about half the average export levels of the period 1990–1998. Most of this has been exported as copra, but some small-scale milling of coconut oil has also recommenced. The industry has shown remarkable resilience in the face of adversity. Current production is still only about half of its potential and, in the short to medium term, market prospects are reasonable. There is

strong economic justification for encouraging a significant expansion in coconut production. The main suggested intervention is to increase the capacity of villagers to process their coconuts into improved-quality copra through the provision of key copra dryer components. Beyond conventional copra and coconut oil, other coconut products offer added value. These include virgin coconut oil and coconut oil as a diesel substitute. These are niche products that enter quite different marketing chains and command premium prices. There are both export and significant domestic markets for virgin coconut oil. Our analysis shows that SI could have a substantial, and even expanded, coconut industry just supplying the domestic market with food, edible oil, and biofuel.

Cocoa is now the only other significant export crop. Exports fell during the ethnic tension (1998–2003), but increased markedly in 2003 when they were about 30% greater than the average for the pre-tension period and at almost record high levels. There is considerable potential to increase cocoa production and exports. This potential resides with rehabilitation of existing village cocoa production, rehabilitation of abandoned plantation cocoa blocks, improved production techniques in existing stands, and replacement of existing cocoa stands with improved planting material.

Livestock is an important component of subsistence production, and animals are kept by 75% of rural households. Pigs and chickens are the dominant species. There is significant potential to improve the productivity of subsistence pigs through better feeding and husbandry practices. The Honiara market could absorb twice as many pigs as are presently shipped there from Malaita. The cumulative benefits of widespread adoption of improvements would be substantial.

Chickens are kept in villages in low input–low output systems whereby they scavenge for feed, but are occasionally fed to prevent them from becoming feral. Simple husbandry and the expanded use of dual-purpose birds (meat and eggs) would greatly increase the value of annual production. Cattle and goats are kept by a small number of households and currently contribute little to the national economy. There is scope for increased cattle

production, commencing with the distribution of tethered cattle to utilise some of the country's vast grassland resource. Honeybees are kept by about 300 households and a small honey export market was developing prior to the ethnic tension, with 30 tonnes exported in 1999. The honey industry has considerable potential to expand, focusing on geographically isolated islands where the Asian bee has least chance of invading. Returns on investment per hive are reported to be excellent.

SI has large stocks of indigenous nuts, such as ngali nut (*Canarium* spp) and cutnut (*Barringtonia* spp), with commercial potential. The trees and nuts are indigenous, widespread, common and an important component of traditional farming systems and diets. The nuts are low volume and weight, nonperishable and potentially high value. There is a need to encourage and support private sector investment in processing and marketing of indigenous nuts, to help establish and stimulate supply chains to private buyers, and to help develop on-farm demonstration pilots and regional value-adding initiatives.

Two spices have potential as cash crops. The first is chillies, because of local demand from the fish cannery at Noro in Western Province for use in its 'chilli tuna'. The second is vanilla, because of its agronomic suitability for the seasonally drier Guadalcanal Plains, and the current relatively high prices for vanilla in world markets. Recommended support for chillies is limited to satisfying the domestic market by providing seed and helping re-establish supply chains. Support for vanilla is aimed at long-term sustainable growth in niche markets, and is limited to training and technical assistance in husbandry and curing (processing).

The need to diversify cash-crop agricultural production in SI is well recognised. There is good potential for development of new products from indigenous species. This will require a long-term commitment. An outcome cannot be predicted with confidence because of a number of unknown factors. Technical and training assistance is required to enable stakeholders from a range of disciplines in SI to conduct market analyses and development at local, provincial and national levels.

In developing the study, the team has focused on activities that can provide benefits for food security and cash income generation in the short to medium term. The study team has also focused on activities that can be initiated with relatively small inputs, given the constraints of infrastructure and human resources. These activities are grouped as 13 components, and fall into five categories, as follows:

- > improving food security through enhanced subsistence food production
- > increasing marketing of fresh food for the domestic market, including food processed at village level
- > increasing production of the existing cash crops of copra, virgin coconut oil, cocoa, chilli and vanilla
- > increasing production of animals for subsistence use and domestic markets, particularly pigs, poultry, cattle and honeybees
- > diversifying cash crops in the medium to long term, through the sale of indigenous edible nuts (such as ngali and cutnut), and commercial development of nontimber products from indigenous species.

There are a number of issues that are common to most of the recommendations in this strategy. These are: the need to provide information to rural villagers; the need to increase the capacity within Solomon Islands institutions; the need to provide support for disadvantaged communities; and the possible provision of a small grants scheme. The recommendations can be grouped in a number of ways: into high, medium and lower priorities; by commodity group; and as a group of activities that could readily be implemented through the Community Sector Program (CSP).

1 Introduction

EIGHTY-FOUR PER CENT OF PEOPLE IN SOLOMON ISLANDS (SI) LIVE IN RURAL AREAS. THE VAST MAJORITY OF THESE PEOPLE DERIVE THEIR LIVELIHOODS FROM A COMBINATION OF SUBSISTENCE AGRICULTURE AND SMALL-SCALE INCOME-GENERATING ACTIVITIES, PARTICULARLY EXPORT CASH CROPPING AND FRESH PRODUCE MARKETING.

Their livelihoods are underpinned by the communal ownership of land, which enables all members of a customary land-holding group to access resources for both subsistence and income-earning purposes. Rural livelihoods in SI can thus be conceptualised as two pillars, subsistence agriculture and cash income, supported by a solid foundation of customarily-owned land.

The resilience of this system was demonstrated during the ethnic tension that ravaged the country from 1998 to 2003. Rural people were still able to meet their basic food needs, despite the collapse of the market economy. However, considerable hardship was also experienced in rural areas as a consequence of the tension and, throughout the islands, the people are still having difficulty raising sufficient funds to meet basic needs.

Current Australian Government interventions in SI are in the areas of law and order, the machinery of government, economic governance, basic service delivery in the health and education sectors, community development, land administration and forestry. These interventions have contributed to the restoration of socioeconomic conditions favourable to the stimulation of the rural economy following the widespread disruption caused by the ethnic tension. However, additional interventions are required to improve the lives of most Solomon Islanders, and to restore the incomes of the rural majority to pre-tension levels and beyond. There is also a strong need for interventions that benefit the most vulnerable groups in contemporary SI society:

women, youth and people living in isolated and environmentally difficult areas.

Such interventions would form the basis of a 'rural livelihoods strategy'. The term rural livelihoods is used in different ways in the literature on development, but the focus here is on agriculture, the major source of livelihoods for most Solomon Islanders, with the emphasis on both subsistence food production and cash income derived from agricultural production.

The direction proposed in the study is clearly aligned with the focus in the Solomon Islands National Economic Recovery and Reform Development Plan (NERRDP), which highlights the need to increase assistance to the agriculture and primary production sectors; in particular, cocoa, copra and other food crops, as well as forestry and fisheries. Recommendations will also be aligned with AusAID's Rural Development Strategy, which focuses on reducing rural poverty by increasing opportunities for the poor to generate income.

Initiatives aimed at improving the livelihoods of people in rural areas can address some of the key underlying structural causes of the recent conflict that cannot be solved through the current interventions alone. These include rural to urban drift, youth unemployment, and the broader issues of uneven development and the inequitable distribution of resources. The cost of such initiatives would be modest, relative to the cost of the current interventions, yet the potential benefits in terms of long-term sustainable rural development, and the

concomitant maintenance of peace and law and order, are immense.

The focus of the smallholder agriculture study is limited to the smallholder agricultural sector, and this work is the first step in undertaking a broader collaborative approach with other donors in this sector. It does not aim to provide a fully fledged strategy for developing the rural economy, but proposes a range of small-scale interventions that are specifically targeted at improving rural livelihoods and reducing the vulnerability of rural people, in ways that are economically, environmentally and socially sustainable.

The smallholder agriculture study aims to assist rural villagers to increase their food security,¹ integrate further into the cash economy, reduce their vulnerability to external shocks (both human and natural), and diversify their economic base. The proposed recommendations will target villagers who produce subsistence food, livestock and export crops in SI. Recommendations are made as to how opportunities could be exploited and constraints reduced or overcome.

Some of the problems facing people in SI, and how they can be addressed by the smallholder agriculture study, are illustrated by the example given in the Box below.

Patricia and John* come from the Malu'u and Silolo areas, respectively, in north Malaita. They have three children, two sons and a daughter, all at high school. They have to find \$2700 this year for the school fees alone. There is no possibility of earning this sort of money in north Malaita, so John is working in Honiara as a security guard.

Cash income is very hard for Patricia to find, and the high cost of living means that she cannot afford small luxuries, such as tinned tuna (about \$1.50 per tin). She lives mostly on sweet potato and cassava from her subsistence food garden. She has tried to sell some food in the Malu'u market, but there is little demand and not much cash around, so she gains very little income from this source. The few dollars that Patricia can earn from this income are barely enough for basic needs such as soap or kerosene. They are certainly not enough for a trip to Honiara to see her husband, as a return trip costs \$220 (\$30 by road to Auki and \$80 for the ship to Honiara). As Patricia expressed it, 'Everī samtin hemi barava expensive tumas' (Every item or service is now very expensive).

The livelihood strategy being pursued by the family of Patricia and John is not uncommon for Solomon Islanders, especially those with children attending high school. Their story illustrates a bigger picture, which is: the SI economy is weak and there is only limited demand for goods and services outside of Honiara. The poor state of transport infrastructure and the low prices received for copra mean that it is difficult for a family living in the village to earn sufficient income to pay for big expenses.

There is no information available to villagers about alternative sources of income that can be gained from agriculture. Many people wish to try new ventures, but they lack information, they lack planting material and, in particular, there are no marketing arrangements so that they can sell the produce that they grow.

Thus, many families face the choice of either all members migrating to live near Honiara, or the husband migrating. This brings its own dangers and anxieties, particularly given the recent history of ethnic tension between people from Malaita and Guadalcanal. There is also the concern that the husband might take a new wife and abandon his village family. This migration to Guadalcanal and Honiara was one of the factors contributing to the conflict that gripped SI between 1998 and 2003.

The solution lies in providing a way of gaining cash income for those who are ambitious for their children and themselves, who are prepared to work and who wish to use the two resources that they have — their land and their family labour. This is the challenge for donors and for the Solomon Islands Government — to give this opportunity to the many people whose livelihood strategies are similar to those of the family of Patricia and John.

* Names have been changed

1 Food security has been defined by the Food and Agricultural Organization as: 'Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.' (<http://www.fao.org>)

2 The rationale

2.1 SOCIOECONOMIC CONTEXT

The economy of Solomon Islands (SI) has been described as a dual economy because of the importance of its large informal sector. Given the very low level of formal employment, the informal sector caters for the vast majority of people, who derive their livelihoods from their own land and labour resources. The informal sector may therefore be regarded as the backbone of the SI economy. There are very limited prospects in the short to medium term for significant employment generation in Honiara and other urban areas. Thus most employment growth will have to occur in the informal sector, in rural locations, and be driven by agricultural production and marketing.

With the exception of some limited donor-funded assistance to smallholder copra, cocoa and livestock production, the informal economy has never been a high development priority for donors or colonial and post-colonial governments. Post-World War II economic planning focused on the development of large-scale plantation cash cropping in specific and highly restricted geographic locations, most notably on the northern Guadalcanal Plains. Over time, this narrow economic focus has generated a situation of uneven development. This has been compounded by the difficulty, for both colonial and post-colonial governments, of effectively providing services to the majority of people living in the 'non-economic' parts of the country.

The post-independence economy has also been characterised by the ascendancy of the forestry and fisheries sectors, and these two sectors have provided significant export revenues since the 1980s. Some land and reef owners have received royalty incomes from these industries. However, corruption and mismanagement, coupled with the inability of successive governments to redistribute economic benefits through the provision of services to rural people, mean that the majority of people have received little, if any, benefit.

The difficulties that successive governments have faced in delivering services to rural people reflect the enormous development challenges of SI. Populations are highly dispersed across a vast double archipelago of islands. Inter-island transport and communication services are inadequate, and the road networks on most islands are very limited. The mountainous terrain of the larger islands creates highly isolated communities, some of which are relatively large. Most of the country is continuously wet and, in many places, excessive rainfall is a constraint to agricultural production and infrastructure development. Any development program in SI needs to take into account these significant physical constraints and should seek to build upon existing systems and capacities that already function despite the difficult physical conditions.

2.2 LAND TENURE AND AGRICULTURAL PRODUCTION

It is sometimes suggested that land tenure arrangements are a constraint to agricultural production. Virtually all subsistence food, domestically marketed food, betel nut and export cash crops are grown by rural villagers on land that they access through customary land tenure arrangements. These traditional arrangements vary somewhat between locations within SI, and they are changing in response to modern influences, in particular the growing importance of the nuclear family. Many men today wish to pass on capital improvements, particularly tree cash crops, to their own sons rather than to nephews or other kin. This is a particular problem for matrilineal societies, where sons are not members of their father's clan, but the land is owned by that clan.

Overall, customary land tenure arrangements work well for the villagers who generate most agricultural produce in SI. There are some tensions and land disputes in some places from time to time, but this does not have significant impacts on agricultural production. Most food consumed in SI is produced within the country, cocoa production levels are at record levels, copra production has increased rapidly after collapsing in 2001–2002, and domestic food marketing remains vibrant. There are, however, a number of important constraints to agricultural production, including marketing arrangements, limited transport infrastructure, inadequate attention to quality of produce, and a dearth of relevant information reaching the producers.

Land tenure may be a constraint for other sectors of the economy, particularly in the urban and peri-urban context, and for new infrastructure development. However, the study team does not see land tenure arrangements as a limiting factor in agricultural production in SI.

2.3 CASH INCOME AND SUBSISTENCE AGRICULTURE AS THE TWIN PILLARS OF SUSTAINABLE RURAL LIVELIHOODS

The issues of uneven development and inadequate service provision are significant causes of social and political unrest in SI. Moreover, they are not issues that can be easily redressed through macroeconomic reform and institutional strengthening initiatives. While it is acknowledged that interventions in these areas are important, the inequitable distribution of development benefits needs to be addressed through supporting pre-existing production and marketing systems, which directly benefit the majority of people who live in rural areas. Interventions should address the two interrelated pillars of rural livelihoods in the SI: small-scale income-generating activities and subsistence agriculture.

Interventions need to support income-generating activities that directly benefit rural people. The established smallholder cash crops of copra and cocoa should be the immediate focus of interventions aimed at putting cash directly into the hands of rural people. However, assistance needs to simultaneously focus on the development of alternative exotic and indigenous cash-crop commodities, and on the improvement of livestock production. Such a focus will contribute to a longer-term diversification of both the rural income and national export base.

Interventions should support and enhance the marketing of fresh produce, both between and within provinces. A number of activities that would increase the overall volume and value of locally marketed produce are needed. With the exception of some minor ad hoc initiatives, support to fresh produce marketing has never been a focus of donor or government development programs. Such support would represent a major innovation in the delivery of development assistance to rural people.

There is significant scope for interventions that would positively impact on the second pillar of rural livelihoods in SI, subsistence agriculture. A range of activities that would increase both production and the efficiency of labour are needed. The most important outcome of such activities would be the enhancement of food security in areas where land is under stress and yields of subsistence crops

are declining as a consequence of decreasing soil fertility. Other important outcomes would be the generation of surpluses for marketing purposes, and gains in labour efficiency that would free up labour for other activities. Assistance to the subsistence sector would also have important spill-over benefits for cash income generation. As is the case with fresh produce marketing, subsistence agriculture has received scant attention from either donors or governments in the past, and interventions in this area would again represent a new and innovative approach to delivering development assistance to rural people.

The emphasis on building upon pre-existing systems and capacities greatly increases the likelihood that the proposed interventions will be self-sustaining. Collectively, the proposed interventions would stimulate the informal economy and provide long-term benefits to rural people. Moreover, the long-term diversification of the rural cash-crop base would strengthen economic sustainability and resilience in the context of domestic and international market volatility, while also contributing to more sustainable land use practices. Similarly, support to subsistence agriculture would add diversity to pre-existing production systems, while simultaneously improving the long-term viability of the resource base, particularly in areas where land is already under pressure. It is accepted that smallholder cash-crop development and diversification will never match the relatively high, but unsustainable, income streams currently derived from the fishery and forestry sectors. The proposed interventions would, however, provide long-term and sustainable benefits to the majority of Solomon Islanders.

2.4 GOAL, OBJECTIVES AND BENEFICIARIES

The overall goal of the study is to improve rural livelihoods and contribute to economic recovery and peace building in SI by providing broad-based support to rural people for agricultural production and marketing.

The objectives of the study are explicitly related to the two interrelated pillars of rural livelihoods in SI. The objectives are to:

- > increase food security, the efficiency of labour, and the production of surpluses for marketing through improved subsistence food production
- > increase the cash incomes of rural people through agricultural development, in a manner that is economically, environmentally and socially sustainable.

The beneficiaries of the study's recommendations are the 84% of people in SI who live in rural areas, in particular the most vulnerable: women, young people and people living in isolated or environmentally difficult rural areas.

SI is a diverse nation, and the population is dispersed over a wide area. The recommended interventions are expected to benefit a wide range of rural villagers, and not be limited to those living in Honiara on Guadalcanal. In particular, it is recommended that assistance be given to a number of agricultural activities that are dispersed through much of the nation to increase their productivity. These are: food production, production of quality copra, production of quality cocoa, production of virgin coconut oil, village-level food processing for the domestic market, and sale of indigenous edible nuts.

2.5 GUIDING PRINCIPLES

The proposed interventions are guided by the following key principles; they should:

- > *Have a short to medium term impact.* The expected timeframe for the suggested interventions to have an impact on villagers' food security and cash income is short to medium, which can be defined as one to five years.
- > *Be flexible.* Interventions need to have inbuilt flexibility so that they can respond effectively to changes in circumstances, particularly the emergence of new opportunities and/or constraints. The length of engagement and the level of resources expended need to be realistic, with a preference for longer term funding.
- > *Increase local capacity.* Interventions need to build upon and strengthen pre-existing systems, organisations (including the Department of Agriculture and Livestock (DAL), nongovernment

organisations (NGOs) and rural training centres (RTCs) and capacities. Preference should be given to working with local and regional organisations that have a proven track record.

- > *Have private sector involvement.* The role of the private sector in improving agricultural production and marketing in SI is recognised as critical. The private sector in SI consists of village producers, middlemen, traders and exporters.
- > *Require donor and stakeholder coordination.* Interventions should be closely coordinated with the pre-existing and proposed programs of AusAID, other donors, and other key stakeholders, including SI government departments and agencies. This will avoid duplication and maximise impact.
- > *Be sensitive to the social, cultural and political environment in a postconflict setting.* Interventions should be cognisant of the current postconflict environment and the special needs of vulnerable groups in contemporary SI society, particularly women, youth and people living in remote locations and/or difficult environments.
- > *Consider environmental issues.* Interventions need to be informed by an evaluation of indirect environmental impacts.
- > *Include an exit strategy.* Interventions should include an exit strategy to ensure that benefits are self-sustaining beyond the lifetime of the intervention.

2.6 WHAT THE STUDY WILL NOT ADDRESS

This smallholder agriculture study will not address the following areas:

- > *Forestry and fisheries.* This study does not cover issues relating to forestry and fisheries. An analysis of Australia's interventions in the forestry sector will be undertaken in late 2005. Other donors will undertake analyses of inshore and artisanal fisheries to augment this study.
- > *Department of Agriculture and Livestock.* The capacity of the Department of Agriculture and Livestock (DAL) to effectively support agricultural development throughout SI is currently

very limited. The study does not address the requirements for improvements or restructuring of DAL, although it does include some limited assessment of current DAL capacity, particularly with regard to provision of services such as agricultural extension services. Nevertheless, DAL's critical role in providing services for agricultural production to rural villagers is recognised. The study recommends that activities arising from this analysis, and funded by donors, should involve staff from DAL as much as is practical. It also recommends that DAL staff be involved in many of the recommended initiatives, such as provision of training by staff from rural training centres, and that DAL staff capacity be enhanced to allow some of the activities to be located within DAL. A role for DAL or other public sector agencies in marketing agricultural produce is not envisaged.

- > *Population growth rate.* Solomon Islands' current high population growth of approximately 2.8% per year, coupled with the fact that approximately 40% of the population are less than 15 years old, is a serious constraint to future social and economic stability and growth. The study does not attempt to address these demographic issues.
- > *Macroeconomic issues.* High inflation and declining currency rates are macroeconomic issues that have a strong impact on agricultural commodities and rural livelihoods. Overall, the low value of the SI dollar has been beneficial to commodity exports and domestic food production. It is not possible to discuss the growth rate of agricultural productivity relative to population growth because of the distorting effect of the ethnic tension. These, and other macroeconomic issues, are not addressed in the study.
- > *Large-scale commercial projects.* Large commercial projects, located on Guadalcanal and producing export commodities such as palm oil, have an important place in the national economy. However, our focus is on the majority of the rural villagers who derive few benefits from such developments. Accordingly, the study team has not considered these here.

3 Transport

TRANSPORT CONSTRAINTS ARE A MAJOR ISSUE FOR AGRICULTURAL PRODUCTION IN SOLOMON ISLANDS (SI). IF THESE CONSTRAINTS WERE REDUCED, PRODUCTION OF FOOD AND LIVESTOCK FOR DOMESTIC AND OVERSEAS MARKETS WOULD INCREASE.

Nevertheless, it is important to emphasise that agricultural production and marketing are proceeding despite the current land and sea transport constraints. Discussion in Chapter 8 indicates that domestic marketing of food is a significant economic activity; that copra production is recovering rapidly after the major problems that beset the industry in the early part of the decade; and that cocoa production is at record levels. Reducing the limitations imposed by transport constraints is very important for increasing agricultural production in SI; but transport is not the only constraint on agricultural production, and significant recent gains have been made despite these limitations.

3.1 ROADS

Although the study team did not make a detailed study of transport constraints, it is clear that this issue will have to be addressed if further gains are to be made in marketing of agricultural produce. During field visits, team members noted where repairs to existing roads and bridges, or extension of the road network, would make a significant difference to agricultural production and marketing. Some notes on this follow:

> *Central Province.* The road infrastructure in this province is in a poor state of repair, including the 31 km of road on Small Gela and Big Gela islands. The coastal road on Savo Island has been destroyed in parts. The highest priorities for

road maintenance are the networks in southwest Small Gela and northeast Big Gela. Road repairs would improve access to the regular shipping services of Gela Passage, particularly during the southeast trade wind season for Small Gela.

- > *Choiseul Province.* The logging road from Chirovanga to Choiseul Bay requires upgrading. This is a high priority, given the relatively large area of land with agricultural potential in the northwest of the island. There are some 25 km of road from Kolombangara to Sepa on Choiseul Island. A road network linking these areas with Choiseul Bay would facilitate development of small-scale sawn timber and cocoa, ngali nut and other crops.
- > *Guadalcanal Province.* There are some 320 km of road in North Guadalcanal, although much is in a poor state of repair. Given the agricultural potential of North Guadalcanal and the large market for fresh food and animal foods in Honiara, further road maintenance in North Guadalcanal is a priority. The north coast road has been repaired to some degree, although it still requires more maintenance. In particular, the section between Ruavatu and Aola cannot currently be used. In south Guadalcanal on the Weather Coast, a road was constructed between Marau and Avuavu. It has since deteriorated so much that it cannot be used by vehicles, except for very short stretches. Given the topography and rainfall extremes, agricultural potential is

limited, and road reconstruction could not be justified on economic grounds. However, the political reality is that lack of development of the Weather Coast was a contributing factor to the recent ethnic tension. Any improvement in transport infrastructure on the Weather Coast would relieve pressure for out-migration and bring some economic benefits to this undeveloped region.

- > *Isabel Province.* The road system is not well developed in Isabel, but roads are important for development. There are 113 km of road, 87 km of which is the Hograno–Kia–Havulai gravel road. This has deteriorated due to lack of maintenance. The Kaevanga to Kolomola road (17 km) is also in a poor state and needs urgent maintenance. The Buala to Holokama road (3 km) requires extension so that potential agricultural areas at Gozoruru and Garanga are accessible. Improvement and extension to these roads will increase agricultural production in these areas.
- > *Makira/Ulawa Province.* There are about 120 km of road in the province, 67 km on Makira, 40 km on Ulawa and 7 km on Ugi Island. An expanded road network that gave access to the productive lands of the Warahito Basin and other areas to the east of Kirakira would increase agricultural productivity. This would require a bridge across the Rama River, and about 20 km of road, to be constructed southeast from Kirakira. Bridges are also required to provide all-weather access from Kirakira to Marou Bay, another potentially important agricultural area.
- > *Malaita Province.* There are about 300 km of road on Malaita Island. Most roads are in a poor to very poor state of repair, as are some bridges. All roads in west and north Malaita require maintenance, beyond the basic work done through the AusAID-funded Community Peace and Restoration Fund (CPRF). A loan from the Asian Development Bank will fund repair of several bridges, but the needs are much greater than this. Given that one-third of the rural population of SI lives on this island, maintenance of roads would have a significant impact on marketing of copra, cocoa, fresh food, pigs and other export crops. There is high population pressure on land in north Malaita, and this is impacting adversely on food production. Construction of roads to the centre of the island and the east coast, so that food and cash-crop production could expand, would relieve pressure on currently used land.
- > *Rennell and Bellona Province.* There are some 86 km of road on Rennell and 32 km on Bellona. Roads are in reasonable condition because of the coral base. On Rennell Island, roads are of crucial importance to agriculture and for access to services, because most people live in the interior of the island and canoe access is difficult. A small increase in the length of feeder roads on Rennell would result in a significant extension of land accessible for agriculture, and would reduce pressure on land nearer the existing road.
- > *Temotu Province.* The lack of a road network is perhaps the most significant barrier to development in this province, particularly on Santa Cruz Island. There are a total of 103 km of roads, mainly on the western side of Santa Cruz. Most of these roads have deteriorated and are unusable. They need urgent maintenance. The only road on Reef Islands (Manuopo to Nialo) is also no longer in use. Existing roads require urgent maintenance and there is a need to extend the road network to access areas of agricultural potential, particularly on Santa Cruz.
- > *Western Province.* There are about 210 km of mostly unconnected and poorly maintained roads scattered among the larger islands of the province. The strategic Noro to Munda road, which links the two major population and infrastructure centres is currently impassable because of lack of maintenance. Repair to this road is the highest priority for road work in Western Province. Years of intensive logging in Western Province have left a significant network of unmaintained tracks. Some of these could be upgraded to improve access to areas of high potential subsistence and commercial agricultural production, for example in inland New Georgia.

3.2 SHIPPING

A frequent and reliable shipping service, to which the island community can link their harvesting schedule, is a prerequisite for agricultural development. Yet ships, shipping infrastructure and government-funded institutions for shipping have all declined significantly since independence. Shipping services between the islands are now very irregular, with inadequate passenger and freight capacities. The current fleet is of poor quality, requires high maintenance, and is inefficient and ageing. The primary means of passenger and freight movement throughout the islands is high-cost, inefficient and by unsafe outboard motor-powered boats.

Significant incentives also need to be provided to the shipping industry to better service more remote locations. For incentives to be effective, regulations need to be strengthened and enforced to ensure that private shipping companies keep to their contracted shipping schedule for a particular route. Furthermore, subsidies, in the absence of improvement in basic infrastructure, are unlikely to be effective. Most important is the provision of all-weather jetty facilities that will lower operating costs and encourage regular services.

4 Background issues

4.1 IMPACT OF THE ETHNIC TENSION

From late 1998 to mid-2003, Solomon Islands (SI) was badly affected by civil unrest known as the 'ethnic tension'. The period of greatest disruption was 1998–1999. The ethnic tension resulted in the collapse of palm oil production, and contributed to a decline in production of copra and cocoa (see Table 8.4). Export revenues halved and rural income-generating opportunities were reduced. The only commodity that survived, and in fact thrived, was round log exports, which, in 2001, represented nearly 80% of total government export revenue. Production ceased at Solomon Islands Plantation Limited (SIPL), Gold Ridge and Solomon Taiyo, and employment opportunities fell significantly. Although the conflict was centred around Guadalcanal, other provinces were affected by losses of employment, businesses and properties in Honiara, and by the general disruption to the economy and breakdown of law and order.

The agriculture sector was badly affected by the ethnic tension. The National Agricultural Research Station at Dodo Creek was destroyed, resulting in the loss of research facilities, research equipment, the library and other important information resources, as well as displacement of skilled people. In addition, the food and tree crops collection at Tenaru, and the livestock breeding stock and cocoa seed garden at Tenavatu on Guadalcanal, were abandoned, and looted by militants. Field experimental stations in four locations were also abandoned. Most facilities

at the National Agricultural Training Institute at Fote on Malaita were destroyed or looted during the ethnic tension.

The return to Malaita of large numbers of people who were displaced from Guadalcanal and Western provinces increased the rural population, exerting pressure on land, food production and the cash economy. On Guadalcanal, internal displacement of the local population and breakdown of law and order, particularly on the Weather Coast, resulted in fear and instability among the people. Livelihoods in many villages on the Weather Coast of Guadalcanal and in some parts of Malaita also deteriorated. Many families survived the ethnic tension through relying on subsistence food crop production and harvesting marine resources. It is important to emphasise, however, that many of the problems in the agriculture sector preceded the ethnic tension.

In its recovery strategy after the ethnic tension, the government has made the production sector, and in particular agriculture, a priority, but has not provided adequate resources to support the sector. In 2004, the Solomon Islands Government's budget to DAL was 1.7% of overall allocations. The draft 2005 budget allocates \$6.8 million more to DAL, so their allocation will actually rise to 2.6% in 2005. However, the reality is that most of this increase will go towards specific project initiatives in oil palm production and rural rice production that will probably have few benefits for rural villagers.

4.2 DONOR ACTIVITIES IN THE AGRICULTURE SECTOR

The main donors involved in the SI agricultural sector are the European Union, Republic of China Technical Mission and AusAID. Other donors, including New Zealand and the United Nations Development Programme (UNDP), have been involved in the past.

Donor resources devoted to rural development are very limited in the context of overall program allocations. In 2004, agriculture received 1% of the donor-funded development budget. The figure remains limited in the draft 2005 development budget, at 1.7%. Analysis of recent donor budgets reveals a significant decline in the allocations to agriculture, from a peak of \$12 617 000 in 2000 to only \$734 000 in 2004. Although the figure for 2005 remains low in percentage terms, the draft estimate of \$16 178 726 is a major improvement over 2004. However, this reflects the significant overall increase in donor support for 2005, and not a significantly higher priority for agricultural activities.

The current level of donor commitments for future funding is not sufficient to meaningfully address the identified constraints to improving rural livelihoods. A series of donor-funded teams visited SI in 2003 and 2004, looking at rural development issues. Consequently, expectations regarding donor intentions to improve rural livelihoods are high. However, no funding or programming has been forthcoming as a result of these visits. The most significant proposed activity is the EU-funded agriculture and rural development sector strategy. This 18-month initiative is planned to start in 2005. Currently, there are no substantive donor plans in place to address the significant rural needs for improved food security and increased cash incomes.

4.3 PREVIOUS AGRICULTURE DEVELOPMENT EXPERIENCE AND LESSONS LEARNED

Most development assistance in the past has concentrated on cash crops and livestock, in particular copra and cocoa production and cattle development. Subsistence food crop production and domestically marketed food have been neglected. This is because the colonial administration, and

later the Solomon Islands Government, assumed that subsistence production was adequate and that the highest priority was to get cash into the hands of rural villagers. This was a reasonable assumption 30–50 years ago, but it is no longer true, given that the increasing population is placing pressure on land, and crop yields are declining in an increasing number of locations. Villagers now need some assistance with food production, especially as technology developed elsewhere in the South Pacific can now be used in SI. Some decades ago, domestically marketed food was a tiny subsector. However, it has grown substantially over the past 30 years and now provides significant cash income to many people; for many, it is their main source of cash income.

Key lessons learned from previous agriculture development support include:

- > The whole process of commodity development should be addressed, from production to marketing. In the past, there has been more focus on production than on processing, quality control and marketing.
- > Both extension officers and farmers need training on business aspects of agriculture enterprises. In the past, lack of business skills and weak management contributed to the failure of many agriculture enterprises. Training needs to be appropriate and timely, with regular follow-up. Although more resource-intensive, a targeted business-mentoring approach would be more likely to succeed than a classroom skills-transfer approach.
- > Nuclear and immediate family units have a higher success rate in sustaining businesses than do community groups.
- > A transparent process with clear guidelines is needed to support income-generating activities. There should be no political interference and, to avoid conflict and maximise chances of a project's success, guidelines must be followed in selecting beneficiaries for agricultural assistance.
- > Any support must not displace local initiatives. What is already being done and what is working must be carefully considered before intervening.

- > It is crucial to consider cultural and social issues when designing and implementing agriculture support programs.

4.4 GENDER, SOCIAL AND CULTURAL ISSUES

A typical rural household consists of an extended family of father and mother, their children, and close relatives, who live together. These people practise subsistence agriculture and live in small, scattered villages, mostly on the coastline. They are largely self-sufficient, with each household growing its own food and building its own house using locally available materials. Self-reliance is facilitated by access to customarily-owned land, and support from other members of the clan and tribe.

In a typical rural household, the mother and her daughters are responsible for food production, firewood collection, family chores, child care, community work, and some income-generation activities. Their role in food production involves clearing, hoeing, planting, weeding, harvesting and cooking. Women also collect wild foods, such as ferns from waterways, nuts from forests and marine food from coastal reefs and mangroves. The father is also involved in food production, mainly doing heavy manual jobs such as felling and primary brushing, but most of his time is spent on cash-crop (copra and cocoa) production and fishing.

These rural households need cash to meet basic needs such as school fees, clothes, kerosene, soap and other consumables. However, many households have limited opportunities to earn cash income in the rural areas. Household members are generally not full-time cash-crop or livestock farmers. They are involved in a host of other activities, including attending to family, social and community obligations. Sharing, based on extended family links, is the social security system that supports households. Food produce, and income from both food and cash cropping, are shared. Individual wealth accumulation is not a high priority for most people. Contributing towards common village activities such as feasts and providing bride price are household obligations. Traditional social and cultural obligations can have negative impacts on business undertakings. For example, village retail shops are struggling to remain viable because they discourage buying on credit.

Many rural businesses have failed in the past because of mismanagement. People have limited business knowledge and skills. There is potential conflict between subsistence food production and the desire for cash income. Food and cash crops often compete, with cash crops taking up most of the prime arable land and the men's labour. Any development program for communities needs to consider cultural and social attitudes to work and money, and that the social fabric is fragile. Volume 2, Chapter 3 provides more detailed information on gender, cultural and social issues in SI.

The 1999 census reported the adult literacy rate at 76%. More than 80% of adult males, but fewer than 70% of adult females, were literate. There were differences between provinces, with people in Western and Choiseul and those in Honiara having a higher literacy rate, and those in Malaita and Temotu, a lower rate. The large number of languages in SI is not a major constraint to communication, as Pijin and English are widely spoken. Only 55% of the 5–19 age group went to school in 1999, and more males than females attended. No more recent data are available.

There are a number of significant health problems in SI, the main communicable ones being malaria, acute respiratory infections, tuberculosis, diarrhoea, skin diseases and sexually transmitted diseases. Non-communicable diseases include maternal deaths, malnutrition, diabetes and hypertension.

There are moderately high levels of child malnutrition in SI. Data on child nutritional status were assembled for the publication *Solomon Islands Human Development Report 2002: Building a Nation* (SIG 2002b). These indicate that 11–14% of children under five years of age were malnourished (that is, they had low weight-for-age) in the period 1993–2000. There are no more recent data available, nor are data available on the spatial distribution of child malnutrition.

There is a risk of an HIV/AIDS epidemic in the medium term, but the possible severity and impact of this are unknown. However, even moderately low rates of the virus in the population would place additional strain on a health system that is struggling to cater for the needs of the rapidly growing population.

5 Environment and population

5.1 ENVIRONMENT

Solomon Islands (SI) consists of a double chain of islands stretching for 1400 km along a northwest to southeast axis, from 5° to 12° south of the equator (See Figure 1 on page viii for an overview map).

There are six main islands, and almost 1000 smaller islands, atolls and reefs, with a total land area of around 28 000 km².² The islands, which form part of the Pacific 'Ring of Fire', lie directly along a subduction zone at the boundary of the Pacific and Indo–Australian tectonic plates. The interaction between the two plates has formed the geologically young islands through the processes of uplift and volcanic activity. The islands are still rising from the sea, but are simultaneously subject to localised subsidence and erosion caused by constant heavy rainfall and frequent seismic activity.

The larger islands are almost entirely of volcanic origin, with rugged volcanic interiors surrounded by areas of uplifted terraces. Some of the smaller islands are also volcanic in origin, while others consist of raised coral atolls. There are both active and dormant volcanoes in SI. Vegetation in most parts of the islands consists of dense tropical forest. However, *Themeda* grasslands cover extensive areas of the northern plains and foothills of Guadalcanal Island and parts of the Florida group, and are burnt on an irregular basis. With the exception of the

small atolls and the Guadalcanal Plains, the islands are rugged and mountainous, with a predominance of ridge–valley landscapes and steep relief which make them unsuitable for large-scale agriculture.

Soil fertility varies widely between and within the islands, ranging from quite infertile and mildly toxic soils, to highly fertile soils derived from volcanic ash and alluvial deposits. Most upland soils have good structures, but either lack one or more major nutrients or have a strong nutrient imbalance. Potassium deficiency is commonly associated with calcareous and limestone parent material, while phosphorus deficiency is frequent over volcanic rocks. The most fertile soils are found on the floodplains, most notably those of northern Guadalcanal.

SI lies within the geographic tropics and has a typically equatorial climate characterised by relatively high and uniform temperatures, high humidity and abundant rainfall. Temperatures range from 22°C to 31°C throughout the year, with a mean maximum of around 31°C and an overall mean of around 26°C in lowland areas. Inland temperatures tend to be higher, but temperature also decreases with altitude. There is very little variation in mean temperatures between months. The temperature range of SI is optimal for the growth of a very large range of plants.

² There is considerable confusion surrounding the total land area of Solomon Islands. Estimates range from 27 500 km² (Hansell and Wall 1974–1977) to 30 400 km² (SIG 2002a). It appears that the estimate given in the 1999 population census is erroneous. Following Bennett (2000) and others, 28 000 km² is used here as a broad working figure.

With the exception of the area from northern Guadalcanal to the Florida group (Gela), and possibly parts of Isabel, SI can be classified as 'continuously wet'. Most areas have mean annual rainfall of 3000–5000 mm, with variations depending on latitude, topography and the orientation of islands to prevailing winds. The interiors of the islands experience higher rainfall, associated with hills and mountains, with mean annual rainfall rising as high as an estimated 8000 mm in the mountains of Guadalcanal and Makira. On northern Guadalcanal, mean annual rainfall ranges from 1850 to 3000 mm.

The main seasonal influence on rainfall is prevailing wind conditions. Three geographic patterns can be distinguished: locations that receive most of their rainfall when the southeast trade winds blow between May and October; locations that receive most of their rainfall when the northwest winds blow between November and April; and locations where rainfall is spread evenly between these two seasons. The geographical extent and prevalence of each of these rainfall seasons varies from island to island. However, the southeast 'weather coasts' of the larger islands of Guadalcanal and Makira tend to experience significantly higher rainfall than other areas, making them difficult environments for agriculture. Sea travel on the weather coasts is also restricted during the trade-wind season because of rough conditions. Patterns of human settlement appear to be strongly associated with rainfall seasonality, with more people living in areas where rainfall seasonality is derived from the northwest winds.

The continuously wet conditions experienced in much of SI have important implications for agriculture. While the rainfall requirements and tolerance of extremes vary from crop to crop, a working figure for the southwest Pacific is that a mean annual rainfall of 1800–2500 mm is optimal for agricultural production, and a mean annual rainfall of over 4000 mm is excessive. This means that, for many locations in SI, rainfall is somewhat

higher than optimal, and for some locations it is excessive. Sweet potato, which is the main staple food crop for most people in SI, is vulnerable to extended periods of wet weather. This was demonstrated by the wet conditions of September–October 2004, which adversely impacted on sweet potato production in some areas, for example on the Weather Coast of Guadalcanal, resulting in food shortages.

5.2 POPULATION

The November 1999 population census (SIG 2002a) enumerated a total of 409 042 people living in SI. They live in 65 014 households with a mean size of 6.3 persons per household. The vast majority of these people (95%) identify themselves as being ethnically Melanesian, though small communities of Polynesians, Micronesians, Europeans and Chinese also reside in the country. The average annual population growth rate, calculated over the inter-census period 1986–1999, was 2.8%, which implies that the population will double every 25 years. Although the population growth rate is high, it has declined from previous inter-census annual growth rates of 3.4% (1970–1976) and 3.5% (1976–1986). The total urban population in 1999 was recorded as 63 732 people, almost 80% of whom live in Honiara. The rural population was 345 310 people, which is 84.4% of the national population.³

Variation in the distribution of population between the nine provinces is very high, with the three largest provinces accounting for 68.2% of the total rural population (see Table 5.1). Malaita Province alone accounts for more than one-third of the rural population, with Western and Guadalcanal provinces providing another third. The average population density for the country is relatively low, at 14.6 persons per km².⁴ However this figure is misleading because most of the population lives on the less than 10% of the country that consists of flat coastal plains, lagoon islands and atolls. Very few people reside in the rugged mountainous interiors

3 The definition of rural includes both rural villages and rural non-villages. The latter category covers high schools, logging camps, plantations and other places where people are living in neither urban nor rural contexts.

4 This is based on a total land area of 28 000 km², as opposed to the 30 400 km² which is cited in the census. This also has a bearing on the population density figures provided in Table 5.1. The land areas of Choiseul and Western provinces that are used in the census are thought to be inaccurate (by around 50% in the case of Western Province) and have been adjusted for the purposes of calculating population densities.

Table 5.1 Distribution of rural population, by province, 1999

PROVINCE	POPULATION	PERCENTAGE OF RURAL POPULATION	AVERAGE POPULATION DENSITY (PERSONS/KM ²) ^a
Malaita	122 620	34	29
Western	62 739	17	11
Guadalcanal	60 275	17	11
Makira–Ulawa	31 006	9	10
Central	21 577	6	35
Isabel	20 421	6	5
Choiseul	20 008	6	6
Temotu	18 912	5	22
Rennell–Bellona	2 377	1	4
Honiara town	49 107	0	–
Total	409 042	100	15

^a See Footnote 4

Source: SIG (2002a) and author's calculations of population density

of the islands. Population densities vary widely between the provinces, ranging from 4 persons per km² in Rennell–Bellona, to 35 persons per km² in Central Province.

With regard to the distribution of the urban population, Honiara, with a 1999 population of 49 107, accounts for more than three-quarters of the total urban population of 63 732. If the adjoining urban areas of Guadalcanal are included, 'greater Honiara' represents 82% of the urban population of SI. The other urban centres are minuscule in comparison with Honiara. These are, in order of percentage of total urban population: Noro (5%), Gizo (5%), Auki (3%), Tulagi (2%), Kirakira (2%), Taro (1%), Buala (1%) and Lata (1%).

The population of SI has a relatively young age structure, with 41.5% of the population recorded as under the age of 15 in the 1999 census. However, this proportion has declined from 47.3% in the 1986 census. The young age structure means that SI also has a relatively high dependency ratio of 87 (where dependency ratio is defined as the number of persons aged under 15 and over 60, in relation to the number of people aged 15–59). Again, there has been a significant decline since the previous censuses which reported dependency ratios of 112 in 1976 and 109 in 1986.

International migration, both of foreigners moving to SI and of Solomon Islanders going abroad temporarily for work or study, is insignificant. However, internal migration is extremely significant, and though most migration continues to be temporary in nature, there is a growing trend towards permanent migration. The land and settlement issues associated with permanent migration are thought by many commentators to be important underlying causes of the ethnic tension. At the time of the 1999 census, one in six Solomon Islanders was living outside their province of birth, and one in ten had moved in the preceding 28 months.⁵ The main 'destination' areas for migrants have been Honiara and, to a lesser extent, Western Province and the Guadalcanal Plains. Malaita Province has continuously provided the main 'source' of migrants.

⁵ The census also recorded 35 309 people who had been displaced from their usual places of residence as a result of the ethnic tension.

6 Existing support framework for agriculture and delivery mechanisms

OVERALL, THE SUPPORT FRAMEWORK FOR AGRICULTURE IS ALMOST NONEXISTENT IN MANY RURAL AREAS. VERY LITTLE INFORMATION OR SUPPORT COMES FROM THE DEPARTMENT OF AGRICULTURE AND LIVESTOCK (DAL).

Other support for village agriculture is provided by nongovernment organisations (NGOs), farmers' associations, rural training centres (RTCs), women's groups, the Commodity Export Marketing Authority (CEMA), certain private businesses and certain individuals. These organisations provide a potential mechanism to deliver information and technology to rural producers.

6.1 DEPARTMENT OF AGRICULTURE AND LIVESTOCK

The DAL is currently subdivided into four divisions: Extension and Training, Research, Livestock and Veterinary Services, and Planning and Management Services (PMS). The Solomon Islands Quarantine Service is currently treated as a section within Livestock and Veterinary Services. PMS includes the Land Use Planning section (LUP). The divisions that are relevant to this study are discussed in more detail below.

6.1.1 EXTENSION AND TRAINING DIVISION

The DAL Extension and Training division is supposed to work directly with the rural villagers. There are around 150 DAL extension staff in the provinces, mostly men. Current restructuring plans allow for a total of about 100 (established) extension staff: about 10 in each province, except Western Province and Malaita which will have 20 each, and Rennell–Bellona with three. In many cases, the majority of staff are based in the provincial capital.

There is no support provided by government for DAL staff in the provinces, except for their salaries. Most have access to canoe, outboard motor and two-way HF radio, motorbike or vehicle, depending on where they are located in the provinces. These facilities were provided as extension support inputs under European Union (EU)-funded Smallholder Development Programme/Farmers Support Programme activities and Republic of China-funded rice projects, but some are old and need repair because of lack of regular maintenance. Currently, DAL extension officers are only involved in donor-funded activities: the Republic of China-funded rice/vegetable program, EU Micro Project-funded agriculture projects and, recently, Community Peace and Restoration Fund (CPRF) copra and cocoa dryers.

Extension officers provide technical assistance to rice growers and monitor EU Micro Projects. They also organise training for CPRF-funded copra and cocoa dryer recipients. Staff will only visit farmers if they have fuel and are paid a travel allowance. As a result, they only travel to villages if they are visiting donor-funded projects. Almost all extension officers have some general training in agriculture, from certificate to Master's level, and more than 10–20 years of field extension work experience. Housing is a major problem for field officers, and many are not housed in their designated locations. Staff morale is low because of housing problems, lack of direct support from headquarters, and lack of promotion opportunities.

There are six Agricultural Training Centres (ATCs) in the provinces, with varying physical states and activity levels, and some DAL extension officers are based at these centres. No training has been conducted for some years. However, the sites remain valuable provincial resource centres.

6.1.2 RESEARCH DIVISION

The Research division, based at Dodo Creek, played a major role in the delivery of services, both direct to farmers via on-farm field trials and demonstration plots at its field stations, and via technical support to the Extension and Training division. With the destruction of the Dodo Creek Research Station and displacement of research staff, field experimental stations (FESs) in the provinces have become nonfunctional, despite the presence of some research officers on site. The four FESs are located in Western, Temotu, Malaita and Guadalcanal provinces. These FESs hold tree crop and multi-purpose tree research collections, mostly planted in the 1980s. They have not been maintained since 2000, but their plant stocks remain an important asset for future tree and fruit crop development. This is a valuable national resource that can be utilised for propagation and distribution of exotic and improved fruit and nut tree seedlings to growers. Management and utilisation plans for each FES need to be developed to facilitate this.

6.1.3 SOLOMON ISLANDS QUARANTINE SERVICE

An effective quarantine system is essential for the development of Solomon Islands (SI) agriculture. The Solomon Islands Quarantine Service (SIQS) was based at the DAL station at Dodo Creek. With its destruction during the ethnic tension, there are currently no government facilities for the screening of imports of plants and animals. Facilities for the introduction of small livestock currently exist on the Republic of China (Taiwan) experimental farm, but may require upgrading.

The recent invasion of the Asian bee (*Apis cerana*) into Guadalcanal highlights the risk of inadequate quarantine facilities and protocols.

6.2 NONGOVERNMENT ORGANISATIONS

There are several national and provincial NGOs with capacity in agricultural production and development. The Kastom Gaden Association (KGA) is the best known of these and currently has programs in Choiseul, Guadalcanal, Makira, Malaita and Western provinces. KGA seeks to improve subsistence production systems. This provides a good basis upon which to develop future programs, although staff report that their capacity to absorb significant further funding is limited. Most provinces have farmers' associations with the potential to organise agricultural development activities. Networks between DAL, RTCs and other NGOs will be required, and subject matter specialists will need to be sourced from DAL and RTCs or externally.

6.3 RURAL TRAINING CENTRES

There are 23 residential and 12 community RTCs; most are operated by churches and are loosely associated under the banner of the Solomon Islands Association of Rural Training Centres (SIARTC). Residential RTCs teach agriculture as one of their core subjects, and undertake agriculture activities such as food production and income-generating activities. The community RTCs also teach short agriculture courses (4–6 weeks) in blocks. Some RTCs do not have agriculture-trained teachers. RTCs vary in their capacity, but overall they are a potentially valuable resource for training, distribution of planting material, and as buying centres. They need help with generating income from agriculture, with food production for students, and with upgrading the skills and knowledge of teaching staff. Most are supported by student fees, with some support from the churches and the EU through the SIARTC.

6.4 WOMEN'S GROUPS

There are many community women's groups throughout SI, as well as ten national women's organisations. Locally, women's groups are an effective way to deliver agricultural and marketing information to women. Organisations that promote agriculture among women include the Mothers'

Union of the Church of Melanesia, Soroptimist and Voice Belong Mere. The Mothers' Union promotes food production, nutrition and better health among women members. Soroptimist is assisting women in the provinces to establish marketing centres. Voice Belong Mere is an information network that puts out a regular newsletter and radio messages to rural women through the Solomon Islands Broadcasting Corporation. Some of the information is related to agriculture.

6.5 COMMODITY EXPORT MARKETING AUTHORITY

The Commodity Export Marketing Authority (CEMA) was established by the Solomon Islands Government in 1985 to purchase commodities (copra, cocoa and later chilli and ngali nut) via a network of buying centres throughout the country. It was restructured in 2002 to become a regulatory body. Other primary roles now include quality assurance, facilitating market intelligence and issuing export licensing. While a number of the buying centres and points are now operated by the private sector, many remain unserved. CEMA wants to sell major centres to the provinces.

6.6 RURAL FINANCE

There is virtually no lending to the agricultural sector — for either investment or working capital. Financial services in rural areas are extremely limited and mainly located in provincial centres. The ANZ bank has branches in Gizo, Noro and Auki. The National Bank of Solomon Islands has about a dozen branches and agencies in the provinces. In 2004, the Development Bank of Solomon Islands suspended its banking operations. Of the 180 credit unions registered, 20 are reported to be active. There are also a number of savings clubs reported to be operating in Honiara, Isabel and Malaita. Credit services for rural people are virtually nonexistent, and most villagers have no formal savings. For people outside provincial centres, it is costly to deposit money. Overall, performance of microfinance programs has been very poor, with many failed cooperatives, credit unions and other donor-funded schemes.

Lack of credit is not a constraint to production for most rural villagers. Their ability to adopt new technology is dependent on access to land and family labour, both of which are generally available. Villagers can access small amounts of cash for most agricultural inputs, for example for tools and small amounts of planting material. Most technical innovations do not rely on the availability of significant amounts of capital. Nevertheless, access to credit is a significant limiting factor for those who wish to undertake production on a larger scale or adopt some technical innovations; for example, processing coconuts into virgin coconut oil. The lack of availability of credit for working capital is a major constraint for those trading cocoa, copra, fresh food, livestock and other agricultural produce. Some credit is provided to traders, especially for cocoa buying. One major exporter provides credit to a number of cocoa buyers.

On the positive side, small enterprises which have survived without access to formal credit have proven their resiliency and have low debt levels. They have 'proven' their credit-worthiness. However, overall, the lack of formal finance means that growth in the rural small and medium enterprises (SME) subsector has been seriously constrained, distorted and inefficient. This is reflected in the lack of SME involvement in produce wholesale. In the absence of financial services and investment, the rural sector will continue to languish well below its potential to provide sustainable livelihoods for rural people.

In the early 1990s, the Central Bank of Solomon Islands established an innovative loan guarantee scheme. The scheme is reported to have had a reasonable success rate. The guarantee scheme still exists, although it has been dormant for several years. The onus is now on the Central Bank to again promote the scheme among the banking and business community.

A commercial bank has expressed an interest in managing a loan program for viable rural enterprises, provided funds were made available from a third party agency or agencies. This proposal is in line with the SME's financing facility being promoted to the international finance institutions by the Commonwealth Secretariat. A major advantage

of this type of scheme is that it utilises the banking system to determine commercial viability of projects and the discretion of aid donors.

6.7 PRIVATE SECTOR

An inclusive definition of the private sector is used in the development of this study. It includes small semi-commercial farmers, traders, wholesalers and exporting companies. The recovery of the copra industry is an indication of the resiliency of the private sector despite the constraints and adversity faced. Critical private sector weaknesses identified are the dearth of produce wholesale traders and the lack of farm supply businesses. These entities play an important role in rural development and need to be encouraged. There are currently several copra and cocoa exporters who have established their own marketing networks in the provinces. Some exporters provide canoes, outboard motors and two-way radios for their buying agents in rural areas, to facilitate transport of produce to export centres in Honiara. Some also provide credit for their agents. There is only one copra export license holder outside of Honiara.

7 Market opportunities

THE *MARKETS AND MARKETING ISSUES* REPORT IN VOLUME 3 OF THIS SERIES IDENTIFIES GOOD PROSPECTS FOR THE SOLOMON ISLANDS INDUSTRIAL TREE CROP SECTOR TO RETURN TO, AND EVEN EXPAND BEYOND, PRE-TENSION LEVELS.

Solomon Islands (SI) has a highly dualistic economy that depends on agriculture. Even before the ethnic tension of 1998–2003, most of the rural population survived on an annual cash income of less than US\$300. The population was fortunate to have had a strong subsistence base for support. The ability of people to feed themselves during the loss of cash income, displacements and fighting associated with the ethnic tension bears testimony to the strength and importance of the subsistence agriculture sector.

The relatively good past performance of the SI tree crop industries can be explained by a combination of factors:

- > a competitive advantage for SI smallholders in growing these crops
- > the absence of alternative income-earning opportunities compared with producers in Tonga, Samoa and, to some extent, Fiji
- > a functioning marketing system, although imperfect, compared with a number other Pacific Island countries (PIC) tree-crop industries
- > a depreciating exchange rate that has favoured agricultural industries.

The ongoing recovery of the SI coconut and cocoa industries provides an encouraging base for growing rural livelihoods. It is doubly fortunate that both commodities are enjoying a period of favourable prices. The prospects for the oil palm

industry are now more positive with the decision of a Papua New Guinea (PNG) company to invest in the rehabilitation of Solomon Islands Plantation Limited (SIPL).

There are good prospects for the SI industrial tree crop sector to return to, and even expand beyond, pre-ethnic tension levels. Indigenous nuts offer significant opportunities. Profitable export markets are available for a number of spices and other minor products. There are very substantial opportunities for import substitution, particularly for traditional staples, fresh fruit and vegetables and livestock products.

The main commodities or commodity groups considered in this review are coconuts, oil palm, cocoa, food crops, indigenous nuts and livestock products. Volume 3 expands on these in detail. For each major commodity, consideration is given to financial and economic viability; market opportunities; marketing arrangements and performance; marketing problems and constraints; and prospects for industry rehabilitation. Recommendations are made on how marketing, rehabilitation and expansion might be improved.

SI has not been successful in developing nontraditional agricultural exports. In export diversification, the country has lagged behind Fiji (root crops, fresh fruit and vegetables, ginger), Tonga (squash and vanilla), Vanuatu (beef, kava, spices and indigenous nuts) and PNG (vanilla).

The poor performance in this area can be explained by a combination of factors, including a weak entrepreneurial private sector, poor quarantine status, and a lack of suitable transportation links to export markets.

Without progress in the diversification of its smallholder agriculture, SI remains highly vulnerable to the vagaries of international commodity markets. Past efforts have shown successful diversification remains a complex and elusive goal to achieve. Given the constraints faced, the country is fortunate that it still maintains a strong subsistence and tree-crop commodity base.

8 Rural livelihood activities

THE TWIN PILLARS OF LIVELIHOOD FOR MOST PEOPLE IN RURAL LOCATIONS ARE SUBSISTENCE FOOD PRODUCTION AND SMALL-SCALE INCOME-GENERATING ACTIVITIES.

The most important income sources for most rural people are the sale of export tree crops, particularly copra and cocoa, and the sale of fresh food for the domestic market.

The most important livestock are pigs and chickens, with cattle important for a limited number of villagers. Commodity groups with potential for further development include various indigenous edible nuts, chilli, vanilla and certain nontimber forest products.

Small-scale forest exploitation is important for a minority of rural people. Sale of marine foods, including fresh fish, smoked fish, shellfish, trochus shell and bêche-de-mer, is the main source of cash income for some people living on artificial islands, small islands and atolls. These forest and marine sources have not been surveyed and are not considered here.

8.1 SUBSISTENCE FOOD PRODUCTION AND IMPORTED FOOD

Volume 2, Chapter 1 provides an in-depth overview of subsistence food production in Solomon Islands (SI), identifies the causes of stresses, and discusses the provincial differences. In this section the authors discuss the main subsistence food crops, the potential actions that may lead to an improvement in production and their potential economic benefits.

Most food consumed by rural villagers is grown by them in nearby food gardens. Other important sources of food are coconuts, fish, other marine foods including shellfish and mangroves, and fruit and nut trees in the forest or in villages. Subsistence food production sustained the population during the displacements and fighting associated with the ethnic tension from 1998 to 2003. It underwrites the economy and is a major strength of the nation.

Sweet potato is by far the most important source of food energy in SI. It contributes an estimated 65% by weight of the locally grown staple foods (Table 8.1). Other important food crops are cassava, banana, kongkong taro, island taro, coconut, pana and yam. The production of these staple food crops is estimated to be about 430 000 tonnes per year, using projected 2004 population figures (Table 8.1). A tiny quantity of rice is grown by villagers, all supported by an aid donor, with production likely to be less than 100 tonnes per year.⁶

A moderate amount of food is imported into SI, with rice and wheat from Australia being the most significant (Table 8.2). Imported rice is the staple food for most urban people (16% of the national population). Consumption of imported foods in rural locations ranges from negligible in remote locations where there is very limited cash income, to moderately high where there is pressure on garden land and cash incomes are moderately high.

⁶ It is claimed by DAL that about 1000 tonnes of rice are grown in Solomon Islands each year. The figures that were gathered in the field in 2004 indicate that actual production may be as low as 30–50 tonnes and is certainly no more than 100 tonnes for the entire country.

Table 8.1 Estimated production of staple food crops in Solomon Islands, 2004

CROP	ESTIMATED PRODUCTION ¹	
	(TONNES PER YEAR)	PROPORTION OF PRODUCTION (PER CENT)
Sweet potato	280 000	65
Cassava	51 000	12
Banana	34 000	8
Taro and kongkong taro	32 000	7
Coconut ²	26 000	6
Pana and yam	7 000	2
Other ³	2 000	0
Total	432 000	100

Notes:

1. These estimates are crude. They are based on extrapolation from data generated for a detailed 2002 study in Bougainville Province of Papua New Guinea by Bourke and Betitis (2003); observations in nine provinces of Solomon Islands by this team (see the nine provincial reports in Volume 4); and a national review of subsistence agriculture by Tony Jansen (see Volume 2, Chapter 1).

2. This refers to coconuts consumed directly by people, and excludes those fed to pigs, used to make copra or not harvested.

3. Others include swamp taro, giant taro, sago and rice.

Table 8.2 Rice and wheat imports into Solomon Islands, 1999–2004

YEAR	RICE ¹		WHEAT ¹	
	QUANTITY (TONNES)	VALUE (\$ MILLION)	QUANTITY (TONNES)	VALUE (\$ MILLION)
1998	24 000	44	11 000	13
1999	23 000	42	12 000	15
2000	23 000	50	7 500	10
2001	23 000	46	6 700	6
2002	24 000	54	–	–
2003	20 000	57	–	–
2004 ²	–	–	5 800 ³	–

Notes:

1. The source for rice data is FAO statistics (1998 and 1999) and the General Manager (Brian Hutchinson) of Solrice Ltd (2000–2003). The source for wheat imports is FAO statistics (1998 to 2001); and the marketing manager of Global Vision Company Ltd (Matthew Psang) for 2004.

2. For the most recent accounting year used by Solrice, which is May 2003 to April 2004, rice imports were 23 500 tonnes, with a landed value of \$79 million.

3. The estimate for wheat imports for 2004 is based on the rate for the first eight months of the calendar year.

Imported rice and flour contribute an estimated 21% of total food energy consumed in SI (Table 8.3). This figure is comparable to that in Papua New Guinea (PNG), where all imported food items contributed some 20% of food energy consumed in 1996.

About 23 000–24 000 tonnes of rice have been imported each year over the past six years. For the year ending 30 April 2004, rice imports were 23 500 tonnes, with a landed value of \$79 million (Table 8.2). However consumption of rice *per person* has fallen because of the steadily rising population, which is increasing at about 2.8% per year. The decline in consumption is almost certainly

associated with the reduced spending power of consumers in both rural and urban locations. The exchange rate of the SI dollar against the United States dollar has halved since 1997 (from 3.8 in 1997 to 7.5 in 2003). This has resulted in an approximate doubling of the price of imported foods over this period. Imports of wheat have been falling steadily over the past six years, with 12 000 tonnes in 1998 and an estimated 6000 tonnes in 2004. This is related to the closure of the Fielders Flour Mill in Honiara and the importation of wheat-based foods, particularly biscuits, into SI from PNG.

Table 8.3 Calculations and figures used to estimate the value of staple food crops in Solomon Islands, 2004

STEP	
1	The national population in November 1999 census was 409 042 people; and the population growth rate (1986–1999) was 2.8% per year.
2	Based on this growth rate, the estimated population for late 2004 is 469 600 people.
3	The mean daily food energy intake from staple foods is 2665 calories/person/day. This estimate is based on PNG data, an assumption about the proportion of energy derived from staple food crops, and is approximate.
4	Multiplying the estimated population in 2004 (2) by the food energy intake (3) and the number of days per year (365) gives the SI population's estimated annual food energy requirement, which is 457 x 10 ⁹ calories per year.
5	This is equivalent to 124 800 tonnes of rice. If there was no production of any staple food, this quantity of rice (or other food) would have to be imported to satisfy the food energy needs of the population.
6	Rice imports into SI over the past six year have averaged 22 800 tonnes.
7	Wheat imports into SI were about 5800 tonnes in 2004, which is equivalent in food energy to 5200 tonnes of rice.
8	It is assumed that food consumption is in balance with the food needs of the population, less the imported rice and flour-based foods (and some other minor imported energy sources which are ignored here).
9	Hence, the calculated food produced and consumed in SI is the rice equivalent (5), less rice imports (6), less the wheat imports converted to a rice equivalent (7). This figure is 96 800 tonnes. This is the amount of additional rice which would have to be imported if there was no production of root crops, coconuts, banana and other staple foods. Rice is used as the basis for this calculation as it is the cheapest bulk commodity that can be priced. This exercise could be done using sweet potato equivalent and the price of sweet potato in local markets, but this would result in a higher estimate for the value of subsistence food production, so the more conservative approach is taken here.
10	The landed cost of this quantity of rice is \$325 million. It would retail for \$411 million, based on a main urban centre retail price of \$4250 per tonne.
11	The calculated quantity of food produced from staple foods in SI is 96 800 tonnes as rice equivalent, or 337 000 tonnes as sweet potato equivalent. This is about 80% of the estimated production of staple food crops in SI (432 000 tonnes) (Table 8.1). These two estimates are consistent with each other as the production estimates in Table 8.1 are for total production. This includes kitchen waste, unharvested food in the garden and that fed to pigs and other livestock. The estimate of 96 800 tonnes of rice equivalent is for human nutritional intake and is exclusive of wasted food and that fed to livestock.
12	Imported rice provides 17.5% of the total food energy needs in SI; imported wheat provides 3.8%. Thus imported grains contribute 21% of all food energy consumed.

With some known and some estimated figures, it is possible to put a dollar value on the staple food crops consumed. Details of the calculations and assumptions are given in Table 8.3. Estimates are done by calculating the food energy requirements of the human population (457 x 10⁹ calories per year); converting this amount to a rice equivalent (124 800 tonnes); subtracting the quantity of imported rice and wheat from the rice equivalent (which results in an estimate of 96 800 tonnes of rice equivalent per year); and then valuing this amount at the rice import price or retail price. The former figure comes to \$325 million, while the latter figure is \$411 million. Thus one can estimate the value of staple crop production as \$325 million per year. This is a conservative estimate, as it is based on the price of the cheapest source of food energy, imported rice, and it ignores wastage and food fed to livestock. No estimate has been made of the value of other vegetable and animal foods, but this would increase this estimate significantly. To put this figure in

perspective, the combined export value of the major export crops, copra and cocoa, was \$74 million in 2003, and is estimated to be about \$70 million in 2004.

There has been considerable intensification of land use in SI in recent decades. This has been caused by the rapidly increasing population. The agricultural systems are based on fallowing land to restore soil fertility. In the past, fallow periods were 15–25 years long, but in many locations now, they are typically 5–9 years and are as short as 1–4 years in some places. The reduced fallow periods, and often extended cropping periods, have produced food for the growing population, but have also resulted in a reduction of soil fertility, with consequent reduction in crop yields. The reduction in crop yields is now becoming a major problem in some locations. The problem is particularly acute on north Malaita and many small islands, including Bellona in Rennell and Bellona Province; the small islands in the

Roviana, Vonavona and Marovo lagoons; Simbo Island; the Gilbertese settlements in Gizo, and the Shortland Islands of Western Province; Wagina Island of Choiseul Province; Santa Ana and Santa Catalina islands in Makira Province; and a number of small islands in the Russell Island group of Central Province, in particular Loun Island and Maruloan Island.

As well as declining yields of food crops in some locations, there are a number of other significant issues that affect subsistence food production. The first is increasing pest and disease problems, again often associated with more intensive land use. Another is the vulnerability of food crops, particularly sweet potato, to extended periods of very high rainfall. This issue is particularly severe in locations where the rainfall is excessive even in normal years, but where it becomes extremely high in 'wet' years, for example on the Weather Coast of Guadalcanal. Widespread and destructive logging has also reduced potential food garden areas in some locations.

8.1.1 POTENTIAL TO IMPROVE SUBSISTENCE FOOD PRODUCTION

There is considerable potential to increase subsistence food production. The most efficient way to increase production of the staple food crops is adoption of superior varieties. These have been selected, after many years of research in PNG and elsewhere in the South Pacific, for sweet potato, taro, cassava, banana, yam and maize. Planting material is available from the National Agricultural Research Institute in PNG and from the Secretariat of the Pacific Community in Suva. Any increase in productivity results in an improved return on their labour inputs, which is the main criterion that villagers use when deciding whether to adopt new technologies. Therefore, the easiest way to increase production of the staple food crops in SI is to import selected improved varieties of the main foods from elsewhere in the Pacific, particularly PNG, and to evaluate these locally to see whether villagers judge them to be superior to existing varieties.

Declining soil fertility and certain pest and disease

problems are major limiting factors for subsistence food production. However, knowledge about overcoming these limitations is poor. Claims are made about solutions to both issues from time to time, but these claims are mostly untested. When evaluated rigorously for this environment, such claims are generally not substantiated. Urgent research applied to the SI physical environment — high rainfall throughout the year, weakly seasonal or nonseasonal rainfall distribution and uniformly high temperatures throughout the year — is needed on both these issues. However, the authors are not recommending that this research be done in SI, given the lack of capacity to conduct agricultural research there, and the significant resources required to address these issues.

8.1.2 THE POLICY TO INCREASE DOMESTIC RICE PRODUCTION

Encouraging domestic rice production has again become a government priority. The Republic of China (Taiwan) has taken a lead role in the rice development program through technical assistance and generous financial support to DAL and farmers.

Priority given to domestic rice production is based on two premises: 'a high level of grain imports is a good indicator of food insecurity'; and 'the most appropriate way to reduce the foreign exchange drain caused by the import of rice is to produce rice domestically'. In the context of SI, both premises are flawed. SI has a relatively favourable food security status. Rural communities meet their caloric needs by growing staples (particularly sweet potato) and producing export commodities (copra and cocoa) that provide the cash to purchase food (particularly rice). An alternative policy approach to reduce rice imports is to encourage the substitution of other locally grown staples. Based on the principle of comparative advantage,⁷ the latter is a much more appropriate policy response.

⁷ Comparative advantage is the principle that countries should specialise in the production of goods and services that they can produce most efficiently.

The findings of the provincial reports (see Volume 4) suggest that the smallholder rice development program is unlikely to be any more sustainable than past mechanised ventures. These reports show a pattern of low yields, a dependency on subsidised imported inputs, subsidised extension services and major pest and disease problems. With low yields, the returns to labour from rice production are low. It is unlikely that growers will sustain their interest once the high levels of assistance on offer are withdrawn.

8.1.3 ECONOMIC RETURNS FROM INCREASED SUBSISTENCE FOOD PRODUCTION

It is estimated that around 430 000 tonnes of staple food are produced annually in SI (Table 8.1). This staple food production is equivalent to around 130 000 tonnes of rice in calorie equivalent (based on estimates of staple food production in PNG by Bourke and Vlassak (2004)). If there were only a 1% increase in staple food production as a result of improved planting material being introduced into the country, this would represent around a 4300-tonne increase in staple food production (a caloric equivalent of 1300 tonnes of rice). The increase in staple food production can be valued in terms of the value of its rice equivalent. In 2004, the average landed value of rice was \$3360 per tonne, with an approximate wholesale value of \$4000 per tonne (a marketing margin of 20%). Thus the value of a 1% increase in staple food production, in rice equivalents, is around \$5.2 million (= A\$1 million). A 5% increase in staple food production represents a 21 600-tonne increase (6500-tonne rice equivalent). The value of this increase in staple food production is \$26 million.

At least a 5% increase in staple food production could be expected from the introduction of improved planting material over a 5–10-year period. The PNG experience has been, and continues to be, a high rate of replacement of older varieties by newer ones that the villagers believe to be superior. Based on numerous observations, it is highly likely that the mean yield of sweet potato in PNG now is

quite a bit higher than it would have been if villagers had retained their older varieties. This is also true to some extent for yam and taro, but it is most notable for sweet potato and banana.

This study's proposed intervention to increase subsistence food production is estimated to cost A\$1.5 million, spread over 3 years (see Chapter 10). If this resulted in only a 2% increase in staple food production, achieved over a 10-year period, the benefits exceed the costs by almost A\$10 million, with an estimated internal economic rate of return (IRR)⁸ of 74% over the period. It is difficult to envisage a development program that could generate a higher level of economic returns and have the benefits spread more widely throughout the community.

8.2 DOMESTICALLY MARKETED FOOD

Produce export opportunities are severely constrained by a particularly unfavourable fruit fly status. Virtually no export of fleshy fruit and vegetables would be permitted without quarantine treatment. Fiji is the only Pacific Island country (PIC) that has been able to successfully operate a commercial quarantine treatment facility. SI does not have the necessary airfreight capacity to consider such an investment. The best market opportunities for fresh produce overwhelmingly lie with domestic markets, where the exchange rate now clearly favours domestic production.

Fresh foods, including betel nut, marine foods, and animal foods, and firewood are significant sources of cash income for many rural villagers. There is a hierarchy of marketplaces within SI. The largest is Honiara and the surrounding rural area, where most of the 60 000-plus population is unable to grow much of its own food. The second level includes the small urban areas of Noro, Gizo, Auki, and Tulagi. At a third level, there are also very many marketplaces in small 'urban' centres such as Kirakira, Munda, Buala and Lata; at other government, church and business nodes; and in rural areas. The significance of rural markets varies

⁸ The internal economic rate of return (IRR) is the measure of the return on the investment. It is defined as the discount rate that makes the net present value (NPV) of an investment equal to zero. NPV is the future stream of benefits and costs converted into equivalent today-value terms. This is done by assigning monetary values to benefits and costs, discounting future benefits and costs using an appropriate discount rate, and subtracting the sum total of discounted costs from the sum total of discounted benefits.

greatly between islands, and is most developed where there are marked differences in the ecology, resource base and livelihood strategies within one area. For example, in many parts of coastal Malaita, dwellers on artificial islands sell marine foods to those from the inland and coast, and purchase root crops and other garden food in return.

The relative importance of domestically marketed food and other items varies greatly within and between islands. It is most important for those living on the road network in North Guadalcanal and on other nearby islands where there is relatively good access to the Honiara market. These include the islands of Savo and Gela in Central Province, most of Malaita, and southern Isabel. There is some specialisation: for example, Malaita people specialise in pigs, chickens, taro, betel nut, sweet potato and pineapple, while people from Savo Island specialise in crops that grow best in a somewhat drier climate, including watermelon, capsicum, tomato, beans and cucumber.

The study team was not able to estimate the value or volume of fresh produce sold within SI. It is sufficient to note that the income ranges from very minor and incidental to the main source of cash income. It is notable that the volumes being sold per vendor in Honiara market are often quite large, and represent much more than incidental surplus to subsistence food production.

8.2.1 POTENTIAL TO IMPROVE DOMESTICALLY MARKETED FOOD PRODUCTION AND SALES

There is some potential to increase sales of food on the domestic market. Sales have increased in recent years due to a weaker currency and the consequent increase in the cost of imported food. The greatest potential is for the Honiara market, but there are opportunities in some of the smaller urban areas and in some rural locations. Improvements in transport infrastructure, both road and marine, will facilitate greater marketing. Production can be increased in a number of ways. These include: production and sale of foods that are rarely sold now, in particular some fruits and temperate climate vegetables, including brassicas and bulb onions; production and sale of superior varieties

that are more acceptable to the consumer, for example, better varieties of mango; improved post-harvest handling and marketing of fresh produce; improving the safe handling of pesticides, in particular insecticides used to control insect pests on slippery cabbage and head cabbage; and upgrading the physical marketplaces at a number of the minor urban centres.

The potential beneficiaries of improved domestically marketed food production and sales would be people who have reasonable access to Honiara market, but this includes a significant number of villagers, and many of these are female producers. The significance of improving physical infrastructure should not be underestimated, even in small centres. Provision of benches for presentation of food, shelter from the elements, and clean water supply are all important. This is clear from the marked improvement in the main Honiara urban food market in recent years with new buildings and other infrastructure. Transmission of information on current market supply and prices to growers also has the potential to improve the orderly flow of food to the market. The encouragement of trader and wholesaler involvement in produce marketing would also bring with it significant benefits.

8.2.2 ECONOMIC RETURNS FROM IMPROVED DOMESTICALLY MARKETED FOOD PRODUCTION AND SALES

An indication of the benefits accruing from improved domestically marketed food production and sales can be gleaned by looking at a number of the specific interventions that are proposed (see Chapter 10, Component 2):

- > introduction and distribution of exotic fruit trees and vegetables
- > encouragement of off-season pineapple production
- > upgrading of market facilities
- > improvement of road access
- > provision of basic market information.

The availability of good-quality fruit and vegetables at a reasonable price can be expected to generate its own demand. This can be seen from the experience with tomatoes and cabbages in PNG, Hawaiian 'solo' papaya in Fiji, and exotic tropical fruit in Samoa. If an additional 500 tonnes of these fruits were consumed annually, this would represent an estimated farmgate value of around \$2 million.

From mid-November through to the end of January, pineapples are the main fruit on offer in the market, and provide an important source of cash income for farmers from Malaita; for the remainder of the year there are virtually no pineapples available. Through the use of fruiting hormones and appropriate husbandry techniques, pineapples can readily be produced for 10 months of the year. Thus, there is potential to achieve a five-fold increase in the income derived from pineapples. The benefits from this increase would far exceed the cost of transferring the technology.

The produce market is the commercial and social epicentre of any Pacific Island community. It is from here that most micro and small-enterprise activities emanate. Investment in municipal market upgrading can provide a major stimulus to small-business development and generate substantial economic and social returns. Produce exposed directly to the hot tropical sun deteriorates rapidly. According to the Food and Agriculture Organization (FAO), the wastage can range from 10% to 50%, depending on the type of product and the prevailing demand at the time. A major municipal market like Auki might see 300 to 400 tonnes of produce brought to the market on a weekly basis. Better quality produce would be expected to command price premiums over deteriorating produce and thus induce a significant increase in the volume of produce on offer. Such a supply response was clearly evident for the Honiara market following its upgrading.

The provision of strategically located road access, perhaps more than any other investment, is likely to give a high economic rate of return. The returns from the proposed road development on Malaita are likely to be particularly high. The benefits are not only in expanded trade, but also in sustainable long-term land use and food security. Population pressure could be relieved by construction of roads to the

centre of the island and the east coast, so that food and cash-crop production could expand and relieve pressure on currently used land. A similar response might be expected with the rehabilitation of the Bursrata road to service central Malaita. Higher elevation areas have been identified in central Malaita that would be well suited for the growing of brassica crops and other temperate vegetables for the Auki market and for on-shipment to Honiara. This study (Chapter 10, Component 2) proposes that a basic pool of machinery (second-hand) be supplied to the Community Peace and Restoration Fund (CPRF) Malaita road rehabilitation program to significantly enhance its capability.

8.3 EXPORT CASH CROPS

Throughout the 1990s, the main agricultural exports were copra, coconut oil, palm oil, palm kernel oil and cocoa (Table 8.4).

8.3.1 OIL PALM

The Solomon Islands Plantation Limited (SIPL) oil palm plantation on the Guadalcanal Plains was closed and its offices and mill destroyed during the ethnic tension in 1998. Production had not resumed when fieldwork was conducted in SI.

The recent (2004) announcement that New Britain Palm Oil Ltd (NBPOL) has signed an agreement to take over SIPL's oil palm operations is encouraging news. This leading PNG oil palm company has pioneered the development of innovative approaches for introducing oil palm cultivation on customary land and involving smallholders in the industry.

The market prospects for oil palm products are favourable. Palm oil, given its efficiency of production, can expect to gain more value than other vegetable oil in a freer world trade environment. The Malaysian oil palm industry has now reached its limits for area expansion. This offers expansion opportunities for industries in Indonesia, PNG and, now, SI.

Studies in PNG show the oil palm industry to be highly internationally competitive. Analysis of oil palm production on Guadalcanal would likely show it to be in a similarly favourable position,

Table 8.4 Solomon Island commodity exports, 1987–2004

YEAR	COCONUT OIL		COPRA		OIL PALM (PALM OIL AND PALM KERNEL)		COCOA		LOGS		FISH		
	SI\$/US\$1	THOUSAND TONNES	SI\$ MILLION	FOB	THOUSAND TONNES	SI\$ MILLION	FOB	THOUSAND TONNES	SI\$ MILLION	FOB	THOUSAND TONNES	SI\$ MILLION	FOB
1987	2.00			9.5	14.0	8.8	9.5	2.7	41.8			50.2	
1988	2.11			14.9	16.9	16.5	7.4	2.6	40.7			74.9	
1989	2.34			20.6	29.1	22.7	7.9	3.2	46.9			65.1	
1990	2.53	3.0	2.5	10.9	28.4	19.3	11.4	3.5	67.4	399	18.0	53.1	
1991	2.72	2.0	1.9	10.3	26.7	20.9	13.7	4.3	76.4	291	43.1	106.4	
1992	2.93	3.4	5.5	21.3	37.1	35.8	14.4	4.5	128.3	543	33.7	87.9	
1993	3.18	3.4	4.7	18.5	37.7	38.1	16.8	3.9	242.6	591	21.9	82.6	
1994	3.29	0.5	2.0	19.7	22.8	44.2	12.5	2.6	266.6	659	31.6	99.1	
1995	3.41	1.5	4.1	32.8	37.1	72.0	13.4	3.5	300.9	749	49.5	145.7	
1996	3.55	2.5	5.7	23.5	34.3	63.1	12.9	3.0	366.5	833	29.9	105.3	
1997	3.73	5.6	12.5	36.7	36.7	74.4	17.0	3.6	278.2	690	34.6	129.8	
1998	4.82	7.2	19.3	27.5	36.9	94.2	22.8	3.5	151.9	513	34.1	129.1	
1999	4.93	10.3		39.3	16.1	65.1	24.3	2.4	250.1			158.0	
2000	5.11	8.6		34.7	0		9.2	2.3	224.4			41.2	
2001	5.30	0.1		0.4	0		4.5	2.0	190.4			37.3	
2002	6.78	0		2.2	0		27.7	2.9	254.1			70.7	
2003	7.51	0		7.8	0		53.2	4.6	371.4			82.8	
2004	7.48	—		23.5			4.8						

Source: Central Bank of Solomon Islands Quarterly Report (various issues). The 2004 data are projections based on production in the first eight months of year (source data obtained from Commodities Export and Marketing Authority, Honiara).
fob = free on board.

particularly in the light of the significantly lower value of the SI currency. There are still large areas of the Guadalcanal Plains that would be highly suitable for oil palm. Most of this land is held under customary tenure. Therefore, any significant expansion of the oil palm industry will need to be based on smallholder production, involving traditional landowners. Despite the potential, care needs to be taken not to allow the planting of oil palm in locations that are unsuitable. The plantings of oil palm on Vangunu Island in Marovo lagoon is an example of such a location. The Western Province report (see Volume 4, Chapter 9) concluded that: 'The environmental (and social) costs of the plantation have not been taken into account, and the net economic benefits of the oil palm are less than those from traditional and alternative uses of the land. In short, it is hard to imagine a less appropriate form of 'development' for Marovo lagoon.

8.3.2 COPRA

In 2001 and 2002, production and export of copra and copra oil collapsed due to a combination of events related to the collapse of the Commodities Export Marketing Authority (CEMA), the ethnic tension, and economic circumstances (see *Markets and Marketing Issues*, Volume 3). Production of copra increased in 2003 to about half the average export levels for the period 1990–1998. Projected copra production for 2004 (based on the first eight months of the calendar year) is about 85% of the average for the nine-year period prior to the ethnic tension. Most of this production has been exported as copra, but some small-scale milling has also recommenced. The industry has shown remarkable resiliency in the face of adversity and its recovery can be attributed to a combination of factors:

- > a fundamental comparative advantage in copra production
- > the desperation of many rural households for a source of cash income
- > the ability of coconut palms to survive several years of neglect

- > the coincidence of a period of relatively favourable copra prices
- > the marketing infrastructure network of collection centres that had been previously established by CEMA, which could be utilised by private marketers
- > an availability and willingness of the private sector to become involved in copra trading.

Current production is still about half of the production potential, given the large number of coconuts that remain unprocessed each year because of marketing and financing constraints.

Farm budgets prepared for the *Markets and Marketing Issues* report (Volume 3) show that making copra is a financially viable enterprise, provided there is an operating marketing system in place. This financial viability extends to the replanting of coconuts, provided that steel pipes for drying are supplied to farmers. Comparative advantage analysis shows that the planting of coconuts is economically viable for the SI economy. For many rural households, copra still provides the only reliable source of cash income to meet life's necessities and provide small 'luxuries'. Even at a low copra price of \$600 per tonne, the return to effort of about \$19 per day is relatively acceptable against a guideline of \$15 per day. This is not the situation in a number of other Pacific Island countries (PICs).

A feature of many PIC copra industries is the preponderance of senile palms. Fortunately, the stock of coconut palms in SI is relatively young. However, over the past 20 years there has been very little systematic replanting. Without substantial planting over the next decade, the age distribution of SI coconut palms will begin to become biased toward palms entering their declining production phase. The replanting of coconuts needs to be encouraged.

The potential to increase copra production will be limited by global prices and demand. Compared to many other major commodities, the market prospects for edible oils are reasonably good. The production of coconut oil specifically faces competition from the highly competitive and consistently increasing production of oil palm,

soybean and canola. Copra yields are comparatively low, even where higher yielding hybrids are planted. The development of genetically modified canola is also seen as a particular threat.

For the medium term, the interest of other PIC copra oil producers in importing copra is a positive development. There is strong economic justification for encouraging a significant expansion in copra production. Firstly there are abundant unharvested coconuts. Secondly, villagers know the commodity and it has provided them cash income over many decades, despite low returns on their labour input. In terms of 'broad-based economic growth', copra is the most widely grown commodity in SI and any improvement in production has the potential to positively impact on a very large number of villagers. There are a number of factors that constrain further increases in production. Some of these, such as world prices and the dispersed nature of the archipelago, do not lend themselves to donor intervention, but some do. The main suggested intervention is to increase the capacity of villagers to process their coconuts into improved-quality copra through the provision of key copra dryer components.

Up until the late 1990s, there were nine conventional crushing mills producing crude coconut oil. This crude coconut oil was then shipped to Europe for further refining. Studies undertaken in other PICs raise serious questions about the economic wisdom of SI reinvesting in conventional copra milling operations that offer little added value.

8.3.3 VALUE-ADDED COCONUT PRODUCTS

Beyond conventional copra and coconut oil, there are high-value coconut products that offer greater value. These products include virgin coconut oil and coconut oil as a diesel substitute.

For coconut oil, the term 'virgin' is taken to mean oil that is pressed without any prolonged high temperature. The end product is characterised by a neutral clear colour and the attractive aroma of a distinct coconut flavour. Virgin coconut oil is distinctly different from oil pressed from copra at high temperature (crude coconut oil) which requires expensive chemical-based refining, bleaching and

deodorising before it can be used as edible oil.

Virgin coconut oil products are often organically certified, giving them additional consumer appeal. Two types of mini-mills producing virgin oil have been established in SI: one involves direct micro-expelling of oil from coconuts, bypassing the conventional copra-making stage, and the other involves cold pressing of oil from copra.

Unlike copra and crude copra oil, these are niche products that enter quite different marketing chains and command premium prices. There are both export and significant domestic markets for virgin coconut oil. Financial analysis shows that, in SI, both operations are viable at prevailing prices if they are operated regularly with a high level of throughput. This viability is significantly enhanced if there is a modest increase in ex-factory prices. Such price increases are a reasonable expectation as markets are developed and the advantages of organic certification are realised. Both types of enterprise would benefit from the provision of marketing support and, in the case of cold-pressed copra oil, measures to improve the quality of copra.

Compared with those in other PICs, direct micro-expeller (DME) mills in SI have made a promising start. However, it is unlikely that virgin oil produced from DME mills could account for much more than about 5 to 10% of SI copra, given the need to achieve high throughput rates to achieve financial viability, and the logistical and quality control constraints.

It is conceivable that SI could have a substantial, and even expanded, coconut industry that only supplied the domestic market. The copra equivalent of coconuts consumed as food is estimated to be around 20 000 tonnes. Considerable volumes of edible oil are imported. With the availability of virgin coconut oil, much of this imported oil could be replaced. Support for a promotional campaign to encourage the use of locally produced virgin coconut oil is proposed.

Coconut oil 'biofuel' can substitute for distillate for power generation and transport. At current production levels, there would not be sufficient coconuts to meet the country's distillate requirements.

The proposed recommendation for the rehabilitation of the coconut industry is two-pronged:

- > an immediate emphasis on helping to shore up the basic viability of copra exports
- > facilitating the efficient transition of the industry toward selected value-added uses for coconuts.

8.3.4 COCOA

Cocoa is now the only other significant export crop (Table 8.4). Average production for the nine years prior to the ethnic tension was 3500 tonnes per year. Exports fell during 1999–2002, but increased markedly in 2003, when they were about 30% greater than the average for the pre-tension period, and are now at almost record high levels. The robustness of the predominantly smallholder cocoa industry during these difficult times can be attributed to a number of factors:

- > The years 2002 and 2003 were a period of relatively favourable world market prices.
- > Cocoa, grown as part of a traditional mixed cropping system, gives reasonable returns to labour even when prices are relatively low.
- > Cocoa marketing was already deregulated and did not suffer from the collapse of CEMA the way the copra industry did.
- > The marketing system remained essentially intact in the main production areas.
- > There was a competitive marketing system in which buyers actively sought cocoa beans.
- > Cocoa was better able to absorb increases in shipping costs due to its relatively higher unit value.

The world market for cocoa in the medium term remains favourable. Superimposed on this is the ongoing political turmoil in Côte d'Ivoire, the world's largest cocoa producer. At projected farmgate prices, SI smallholders will receive a reasonable return for effort for planting and maintaining cocoa.

Despite relatively low yields of cocoa, the industry is seen to be an economically efficient generator of foreign exchange. There is considerable potential to increase cocoa production and exports in locations where the climate is more favourable and where transport costs are not excessive relative to the value of cocoa grown. The potential to increase production resides with rehabilitation of existing village cocoa; rehabilitation of abandoned plantation cocoa blocks; improved production techniques in existing stands; and replacement of existing cocoa stands with improved and black pod-tolerant planting material from the Papua New Guinea Cocoa and Coconut Institute. Cocoa quality enhancement is largely through improved fermentation and drying.

The most favourable locations to expand cocoa production are in North Guadalcanal, Malaita, Makira and Isabel. There is also good potential in Western and Choiseul provinces. There are opportunities for cocoa rehabilitation to be part of a special-needs program for some locations on the Guadalcanal Weather Coast.

8.3.5 ECONOMIC RETURNS FROM INCREASED CASH-CROP EXPORTS

One of the priorities of this study is to get cash income into the hands of as many rural villagers as possible through increased exports of quality copra and cocoa. Given the high price discounts that poor quality copra incurs, a 15% overall price premium resulting from the widespread adoption of steel flues for drying is a reasonable expectation. Achieving such a price premium, with a small increase in production over a 10-year period, generates a A\$4 million net present value (NPV) and IRR of 48% (Chapter 10). A similar result is expected from the component directed at improving cocoa quality.

The other study component directed at the coconut industry is to increase the production of virgin coconut oil for domestic and export markets. The emphasis of this component is directed at achieving the price level required for a substantial viable industry. An expenditure of A\$345 000 directed at increasing the price of virgin coconut oil is expected to facilitate the development of an industry with an annual added value exceeding A\$1 million (see Chapter 10).

8.4 OTHER SOURCES OF CASH INCOME

Some people in rural locations derive cash income from sources other than agricultural production. These include small-scale trading, mostly of imported goods, in village stores (canteens); transport businesses based on vehicles and canoes; small-scale timber milling; artisan work such as carpentry; some wage labour; and trading and processing of wet coconut, copra, cocoa and marine products. The authors have not been able to estimate the total value of these activities, but sense is that they are restricted to a limited number of people in rural areas. Most people engaged in other cash-earning activities do not earn much money, although there are a handful of entrepreneurs in most locations who have a greater involvement, especially with purchasing and processing copra and cocoa.

In many rural areas, there are a few people in salaried employment; in particular, health workers and teachers. Their cash incomes are often less than those of their urban counterparts. Nevertheless, they are a source of some income in those communities, either from money spent locally or through transfers to their relatives. In some locations, royalties from timber sales provide some cash income. Remittances from relatives working in Honiara or in enclave development locations are important in some places. For example, significant amounts of money are sent to Santa Ana and Santa Catalina in Makira Province; Savo Island in Central Province; Wagina Island in Choiseul Province; and Rennell and Bellona Islands. These other sources of cash income, while limited in rural areas, are an important market for the outputs of the small-scale farmer.

8.5 LIVESTOCK

Livestock are an important component of subsistence production and are kept by 75% of rural households. Pigs and chickens are the dominant species. Pigs have a very high cultural importance and are used primarily for feasts, to pay bride price and to meet other cultural obligations in the traditional culture. There is significant potential to improve the productivity of subsistence pigs through better feeding and husbandry practices. Small-

scale commercial production of pigs is common on Guadalcanal and Malaita, for selling into the Honiara market. At present, approximately 50 pigs per week are shipped in from Malaita, returning approximately \$2 million annually to that island. The Honiara market could easily absorb twice this number at present, and there is potential to export to Bougainville (PNG). Production of native pigs for the feast market is primarily conducted in distant Temotu Province, and pigs arrive into Honiara, 200 at a time, on the decks of merchant vessels. The surplus of pigs throughout the provinces is easily sold for the feast market or into the local butcheries. Butcheries prefer to purchase crossbred pigs, as these have generally been fed some level of concentrate feeds and so have more meat and less fat. It is difficult to estimate the annual value of SI pig production for both village and commercial use, but it would be in the order of \$20 million.

Chickens are kept in villages in low input–low output systems whereby chickens scavenge for feed, but are occasionally fed to prevent them from becoming feral. Feeds consist of cut coconuts, papaws, other fruits, and food scraps. Housing is rarely provided. Eggs are rarely found or collected, except by the local dogs. Eggs that are located are generally placed under a brooding hen, rather than being eaten, so as to ensure future populations. Hens hatch eggs in bush areas surrounding the villages, and mortality of chicks is generally very high, as a result of exposure, diseases, and predation by dogs and hawks. Birds are sold live, among villagers or through the local markets, or are killed for local consumption. The population of village poultry is estimated to be approximately 220 000, with an annual production value of approximately \$5 million. Simple husbandry and the expanded use of dual-purpose birds (meat and eggs) would greatly increase the value of annual production.

Cattle and goats are kept by a small number of households (probably fewer than 150) and currently contribute little to the national economy. Cattle, in particular, have potential for greater use in smallholder coconut plantations, because of their dual role as sweepers (reducing undergrowth through grazing) and meat producers. Lessons can be learned from the mistakes of previous cattle

development work so as to initiate productive and sustainable systems for local consumption and import substitution. However, the village-based, smallholder cattle industry will work most effectively in collaboration with an active medium to large-scale commercial sector. The latter subsector requires a specific study to identify appropriate parcels of alienated lands, supportive surrounding communities, and investors willing to collaborate with the smallholder sector, to improve the overall production of beef cattle in the country.

Honeybees are kept by about 300 households and a small export market was developing prior to the ethnic tension, with 30 tonnes of honey exported in 1999. Honey is consumed locally, and sales are coordinated through a cooperative that also supplies basic necessities for production. Unfortunately, the Asian bee entered Guadalcanal during the ethnic tension and has devastated production on that island. It is probable that the Asian bee will spread to the major islands over time, although the more remote islands may be spared. Strategies are currently being developed to minimise the impact of the Asian bee, and early results are positive. Honeybees have potential for remote islands where alternatives for income generation are very limited.

8.5.1 POTENTIAL TO IMPROVE LIVESTOCK PRODUCTION

Weaning and subsequent growth rates of native pigs can be increased by 80% and 50%, respectively, through adoption of improved feeding and management systems. Growth rates can be further improved, by up to 100%, by introducing European breeds to produce crossbred pigs to replace native pigs. The cumulative benefits of widespread adoption of improvements would be substantial.

Village chicken production could be dramatically increased by the introduction of pens to protect chickens from weather and predation, simple husbandry to reduce chick mortality, improved feeding systems, and the introduction of dual-purpose birds. Improved viability of commercial poultry production is dependent on local

production of high quality feeds at lower cost than imported feeds.

There is enormous scope for increased cattle production, commencing with the distribution of tethered cattle to utilise some of the country's vast grassland resource. Furthermore, the current large-scale importation of beef offers a considerable profit margin for local production. The scope for improved productivity is vast, but the challenges are significant, because of the steady decline in the sector over the past 25 years.

The honey industry has considerable potential to expand, focusing on geographically isolated islands where the Asian bee has least chance of invading. Returns on investment per hive are reported to be excellent.

8.5.2 ECONOMIC RETURNS FROM IMPROVED LIVESTOCK PRODUCTION

The income generated from the proposed pig and poultry components is projected to be significantly more than the estimated A\$600 000 expended on each over 2 years (see details in Chapter 10). The increased income is via expanded availability of pig and poultry products and reduced costs through better utilisation of local feed materials.

8.6 INDIGENOUS NUTS

SI has large stocks of indigenous nuts, such as ngali nut (*Canarium* spp) and cutnut (*Barringtonia* spp), with commercial potential. The trees and nuts are indigenous, widespread, common and an important component of traditional farming systems and diets. The nuts are low volume and weight, nonperishable and potentially high value. Several market analyses have identified economically viable domestic, regional and international markets for these nuts as a unique and novel product. A nongovernment organisation-supported community in Makira is producing and selling ngali kernel oil for export to Australia as an ingredient in patented herbal medicines.

In Vanuatu, ngali and cutnuts are purchased and processed commercially by a private business, but marketing is limited by supply. SI has a much larger supply base, but lacks private sector involvement. In the early 1990s, ngali nuts-in-shell were purchased by CEMA via its nationwide network of copra and cocoa buying points. Within three years, supply quickly rose from 3 to over 200 tonnes of nuts-in-shell per year (about 30 tonnes of kernels) from existing trees. Processing and marketing of the nuts, however, were unsuccessful, mainly because the SI government agricultural research department failed to turn it over to the private sector after initial (and successful) development and piloting of techniques.

There is a need to encourage and support private sector investment in processing and marketing of indigenous nuts, to help establish and stimulate supply chains to private buyers, and to help develop on-farm demonstrations or pilots and regional value-adding initiatives. Returns to primary producers can be increased by 500% if the lighter, low volume, kernels are shipped, but on-farm commercial processing and packaging techniques need to be investigated before this is possible.

8.6.1 POTENTIAL FOR DEVELOPMENT OF MARKETED INDIGENOUS NUTS

Total production of ngali nuts in SI from existing trees is estimated to be 7000 tonnes of kernels (equivalent to 45 000 tonnes of nuts-in-shell) per year. A tiny proportion of this is marketed in local food markets. The potential commercial urban retail market for simply-packaged ngali nuts in SI is conservatively estimated to be worth \$250 000 per year (5000 kg of kernels at about \$50 per kg), or worth \$66 000 at the farm gate (33 tonnes of nut-in-shell at \$2000 per tonne). The combined markets in neighbouring PNG and Vanuatu are estimated to be worth at least four times the value of the SI domestic market.

In the future, indigenous nuts have the potential of becoming for SI what the brazil nut is for the Amazon, or the macadamia nut is for Hawaii. Ngali and cutnut, despite their inherent quality, are largely unknown outside of Melanesia. To expand beyond identified niche markets, substantial investment in

product and market development would be required. The experience of the Hawaiian macadamia nut (an Australian bush nut) provides a guide to what would be required. The Hawaiian macadamia nut industry depended on the injection of substantial equity and risk capital. Major development of the SI indigenous tree nut industry will require investment on a similar scale to that which has gone into the oil palm industry in recent decades. The end result could well be an industry of equivalent importance. Like oil palm, the nucleus enterprise model is highly appropriate for the development of a major indigenous nut industry.

Until such investment is forthcoming, there are opportunities for a much smaller scale development along the lines of those in Vanuatu. However, there are constraints to even small-scale commercial development. The hardness of the ngali nut shell poses one major constraint. Basic processing techniques also need to be developed and refined. Techniques developed in Vanuatu for processing cutnut are particularly exciting, and could be adapted for use by isolated communities in SI. There is a substantial cutnut resource on the Guadalcanal Weather Coast, and the processing and packaging of these nuts for the local market could prove to be a worthwhile microenterprise.

8.6.2 ECONOMIC RETURNS FROM THE DEVELOPMENT OF A SMALL COMMERCIAL NUT INDUSTRY

A Vanuatu-scale commercial nut industry would be worthwhile in its own right and would justify the proposed expenditure of some A\$500 000. The demonstrated success of this component could provide the catalyst for the agribusiness investment required for a major industry. Should this occur, the longer term economic returns would be exceptionally large.

8.7 SPICES

Numerous spices, such as cardamom, chilli, cinnamon, ginger, turmeric, pepper and vanilla have been previously promoted in SI. In most cases they have not succeeded because of weak marketing

and market linkages, agronomic problems, lack of information on the quality requirements of the market and how to achieve these requirements, and lack of international competitiveness because of inadequate supply and poor quality.

8.7.1 POTENTIAL FOR SPICES

The spice that is currently creating the greatest interest is vanilla, in response to the recent PNG a vanilla boom. Vanilla has high unit value, can be produced on a small area of land without land title, requires only limited labour inputs and, once cured correctly, is nonperishable. In locations where flowering will consistently occur (largely confined to drier areas on the Guadalcanal Plains), vanilla potentially has an important place in SI diversified agriculture. Villagers who have the knowledge to cure quality vanilla and implement this knowledge have a sustainable future in the industry, even at the relatively depressed prices that are projected. Currently, the most important need is to provide existing and potential growers with information on where the crop can be successfully grown and cured. It was this lack of information that caused so much trauma for the PNG vanilla industry as prices have receded to more normal levels.

Good opportunities exist for increased chilli production in Western Province, Malaita and north Guadalcanal for sale to the Soltai cannery in Noro. Production of chilli tuna is currently constrained by the limited supply of dried chilli. Soltai would like to purchase up to 500 kg per year just to satisfy estimated domestic demand for chilli tuna. In a bid to increase supply, they have raised the buying price of chilli from \$8 to \$50 per kg. Soltai feel there are excellent opportunities to increase production of chilli tuna by exporting to neighbouring Melanesian markets where the brand is well known and, in the longer term, to niche markets in Australia and New Zealand and, via internet sales, worldwide. Estimated demand for chillies would be at least 1000 kg per year which, based upon production levels in the 1990s, is achievable.

Ginger, turmeric and pepper offer good potential

in wetter areas if the necessary in-country linkages with marketing businesses can be created. There are important lessons from the Vanuatu experience in this respect.

8.7.2 ECONOMIC RETURNS FROM EXPANDING SPICE PRODUCTION

It is a reasonable expectation that, as a result of the proposed intervention, SI could be exporting 2 tonnes of vanilla annually within five years. At a modest free on board (fob)⁹ price of A\$80 per kg this would represent an industry with an annual export value of \$800 000. The estimated cost of the proposed intervention is A\$150 000.

The *Markets and Marketing Issues* report (Volume 3) identified a currently available market for 10 tonnes of good-quality dried chillies for the production of 'chilli tuna'. The price on offer to farmers is \$50 per kg. An industry valued at \$500 000 could be readily achievable within a few years. This would represent an excellent rate of return on a proposed expenditure of around A\$150 000.

8.8 COFFEE

The existence of PNG's large coffee industry raises the question of the potential of coffee to become a significant contributor to rural livelihoods in SI. SI cannot match PNG's vast expanse of highland areas suitable for Arabica coffee, although there are some locations that could produce quality Arabica coffee.

Twenty years ago, promoting coffee as a major diversification crop would have been a worthwhile rural development strategy. This is no longer the case. In recent decades, there has been an irreversible structural shift in the world coffee economy. A small new entrant selling onto the mainstream world market would now have little chance of succeeding. This changed structure of the world coffee economy has, however, created opportunities for niche marketing that a SI industry may be able take advantage of.

9 This is the value of the product at the time it leaves the exporting country. It does not include any of the costs of getting the product from the port to the importing country (eg freight and insurance).

8.9 COMMERCIAL DEVELOPMENT OF NONTIMBER FOREST PRODUCTS FROM INDIGENOUS SPECIES

8.9.1 THE NEED FOR DIVERSIFICATION

The need to diversify cash-crop agricultural production in SI is well recognised and has been the focus of much agricultural development for more than 70 years. Dependence on a narrow range of internationally traded commodities has resulted in farmers and the SI Government alike being vulnerable to price instability and poor competitiveness. This is a result of geographical isolation and the absence of economies of scale. Governments need a diverse revenue base, and rural people need income-earning opportunities. Lack of both leads to unsustainable resource mining (such as logging), inequality and urban drift.

The model used for agricultural diversification has traditionally been the introduction and costly testing of new exotic (ie nonindigenous) internationally traded cash crops, followed by expensive extension and training to encourage adoption and production. With the exception of the development of coconut and the introduction of cocoa, these have generally been unsuccessful. Agronomically, many have underperformed due to poor management, lack of fertiliser (because of cost), and vulnerability to pests and disease (due to mono-cropping). Economically, they have struggled to compete on world markets. Above all, they have failed to match the social, economic and environmental context within which producers operate in SI. Large-scale plantings are problematic under customary land ownership, and flat coastal land, where the majority of people live, is becoming increasingly scarce. Regular income generation and wealth accumulation is not the primary dynamic of rural life. The clearing of forest for mono-cropping field crops on steep land with thin unstable soils is environmentally damaging. Diversification is still essential, but a new system is needed to identify species and products for development that are more socially, economically and environmentally appropriate.

8.9.2 A NEW SYSTEM FOR DIVERSIFICATION

Species and products that are more appropriate for commercial development under SI conditions are those that are already there and already being used. Rural people regularly use over 500, mainly indigenous, forest species for multiple purposes, such as building materials, foods and medicines. With over 2000 species of plants, Solomon Islanders have developed, over thousands of years, a wealth of knowledge of plants and their uses. Multi-use trees are particularly important traditionally, and they are appropriate for commercial development. Coconuts are so successful in SI because they are a multipurpose indigenous tree. The social, economic and environmental suitability of multipurpose forest trees can be, and is being, enhanced by cultivating them in multispecies agroforest systems. Large-scale colonial-inspired mono-crop coconut plantations on increasingly scarce prime flat coastal land are slowly being converted by rural people (in many cases reverting back) to mixed-species multipurpose agroforestry systems. Matching nontimber forest products with potential markets has now become more feasible, with the development of new markets for the products and new methods to identify and develop them.

8.9.3 POTENTIAL FOR DEVELOPMENT OF NEW PRODUCTS FROM INDIGENOUS SPECIES

There is good potential for development of new products from indigenous species. However, this will require a long-term commitment and may need substantial time to achieve. An outcome cannot be predicted with confidence because of a number of unknown factors. Technical and training assistance is required to enable stakeholders in SI, from a range of disciplines, to conduct market analysis and development on a local, provincial and national level. Technical and capacity building assistance is also needed to assist the progressive development of products and markets with high potential.

9 Recommendations for interventions in agriculture

IN THIS SECTION THE TEAM HAS MADE A NUMBER OF RECOMMENDATIONS ON HOW TO BEST SUPPORT AGRICULTURAL DEVELOPMENT IN SOLOMON ISLANDS (SI). THE FOCUS IS ON COMPONENTS AND ACTIVITIES THAT CAN PROVIDE BENEFITS FOR FOOD SECURITY AND CASH INCOME GENERATION IN THE SHORT TO MEDIUM TERM.

The authors have also focused on activities that can be initiated with relatively small inputs, given the constraints of infrastructure and human resources. These activities are grouped into 13 components, and details are presented in full in Chapter 10.

The 13 components fall into five recommendation categories, as follows:

- > improving food security through enhanced subsistence food production
- > increasing marketing of fresh food for the domestic market, including food processed at village level
- > increasing production of the existing cash crops of copra, virgin coconut oil, cocoa, chilli and vanilla
- > increasing production of animals for subsistence use and domestic markets, particularly pigs, poultry, cattle and honeybees
- > diversifying cash crops in the medium to long term, through the sale of indigenous edible nuts (such as ngali and cutnut), and commercial development of nontimber products from indigenous species.

9.1 ISSUES COMMON TO MOST RECOMMENDED COMPONENTS

There are a number of issues that are common to most of the recommendations to support agriculture in SI.

9.1.1 PROVIDING INFORMATION TO RURAL VILLAGERS

Most people involved in agricultural production and marketing require information with which to make informed decisions and to improve efficiency. Most producers, processors and traders have poor access to relevant information and this is limiting agricultural development. Information is required on production techniques, market conditions and postharvest handling and processing of produce. This applies to both plant and animal production and is spelt out under Component 2 in Chapter 10, although it applies to all components.

Volume 3, Appendix 3.8 lists detailed proposals for the development of a market information system. Development of such a system is implicit in the activities for most other components. Information can be delivered in a number of ways, and these include specialist programs on the Solomon Islands Broadcasting Corporation; written outreach material, including pamphlets and booklets; and other modes, such as theatre groups. The rural training centres (RTCs) provide a useful avenue for offering training and information transfer

to rural villagers, although RTC staff often need more training before they can provide outreach to villagers.

9.1.2 INCREASING CAPACITY WITHIN SOLOMON ISLANDS INSTITUTIONS

There is variable capacity within the key institutions involved with supporting agriculture in SI. Generally, there is a major need to increase the capability of staff within these organisations, including the Department of Agriculture and Livestock (DAL), key nongovernment organisations (NGOs), RTCs and women's groups. Again, this is not spelt out for each component in Chapter 10, but it is implicit that enhancing the capacity of staff within key organisations is part of the activities for each component.

9.1.3 SUPPORTING DISADVANTAGED COMMUNITIES

Economic disadvantage results from climate and location in SI, and has a major direct impact on opportunities for food production and income generation. The largest number of disadvantaged communities are on the Weather Coast of Guadalcanal, where 19 000 people live. The climate is continuously wet, and this regularly threatens food security, as a result of failure of food crops. Geography and extreme topography limit access by road, sea and air (see Guadalcanal Province report, Volume 4, Chapter 3). Other disadvantaged communities exist on the Weather Coast of Makira, and on the remote atolls of Rennell and Bellona and Temotu provinces, but populations there are small by comparison with the Guadalcanal Weather Coast. Disadvantaged communities deserve special consideration for development assistance. The recommended activities which are most relevant for the Guadalcanal Weather Coast are noted in Section 9.5.

9.1.4 INTRODUCING A SMALL GRANTS SCHEME

There is potential to establish a competitively accessed small grants scheme, for entrepreneurs, DAL, RTCs and NGOs, to deliver specific components of the proposed interventions or related proposals. These could include provision of training by RTC staff; training of village farmers in improved crop and animal production; production of extension material; and propagation of planting material of improved varieties. The scheme could be based on the Agricultural Innovations Grant Facility currently being funded by AusAID in PNG. Applicants would need to be supported by a technical advisory panel. This group would help applicants to identify and to develop proposals.

9.2 PRIORITIES FOR IMPLEMENTATION OF THE RECOMMENDED COMPONENTS

The 13 recommended components for improving rural livelihoods and generating broad-based growth can be classed as being of high, medium and lower priority. The high priority components satisfy all of the following criteria. They offer:

- > a high demonstrated economic rate of return
- > a wide distribution of benefits
- > benefits to disadvantaged areas
- > ready implementation within a three-year timeframe.

The medium priority components do not fully satisfy one of these criteria, while the lower priority components do not fully satisfy two of the criteria. The four *high priority components* for improving rural livelihoods are:

1. improving food security for rural villagers (which commences with an investigation of import quarantine needs for SI agriculture)
2. enhancing domestically marketed food
3. increasing production of quality copra
4. increasing production of quality cocoa.

The six *medium priority components* for improving rural livelihoods are:

5. increasing production of virgin coconut oil
6. stimulating village-level food processing for the domestic market
7. increasing pig production for the domestic market
8. increasing poultry production for the domestic market
9. facilitating production and sale of indigenous edible nuts
10. stimulating production of spices for the domestic and export markets.

The three *low priority components* for improving rural livelihoods are:

11. increasing beef cattle production for the domestic market
12. stimulating honey production for domestic and export markets
13. stimulating commercial development of nontimber forest products from indigenous species.

9.3 THE COST OF THE RECOMMENDED COMPONENTS

The total estimated cost of the proposed recommendations, implemented over three years, is A\$15.2 million, broadly broken down as follows (for details see Appendix 1.1):

- > higher priority components (A\$8.3 million)
- > medium priority components (A\$3.0 million)
- > lower priority components (A\$1.3 million)
- > overhead and management costs (20%), (A\$2.5 million).

9.4 TIMING AND PACKAGING FOR IMPLEMENTATION OF RECOMMENDATIONS

The component that should be instigated before any other is an investigation of import quarantine needs for SI agriculture. After that, it would be logical for the highest priority components to be addressed next, followed by the medium priority components and then the lower priority ones.

There are many recommended components and activities. Implementation of each activity will require much dedication, and there will be many obstacles to overcome, given the poor state of infrastructure, limited human resources and low level of support for agriculture in SI. If there were no other considerations, it would be logical to group components together for implementation by relevant managing agents. This would maximise the use of technical and social expertise within SI and from overseas. The suggested groupings are:

Food related components:

1. improving food security for rural villagers — commencing with an investigation of import quarantine needs for SI agriculture
2. enhancing domestically marketed food
6. stimulating village-level food processing for the domestic market
9. facilitating production and sale of indigenous edible nuts.

Cash-crop components:

3. increasing production of quality copra
4. increasing production of quality cocoa
5. increasing production of virgin coconut oil
10. stimulating production of spices for the domestic and export markets
13. stimulating commercial development of non-timber forest products from indigenous species.

Animal production components:

7. increasing pig production for the domestic market
8. increasing poultry production for the domestic market
11. increasing beef cattle production for the domestic market
12. stimulating honey production for domestic and export markets.

9.5 OTHER CONSIDERATIONS

This logical grouping of components may be overridden by certain practical considerations, driven by both political imperatives and constraints within donor organisations. In particular, there is a need to give high priority to the politically sensitive areas of Malaita Province and the Weather Coast of Guadalcanal. The availability of the AusAID-funded Community Sector Program (CSP), also influences the timing of implementation of the recommended components and activities.

Recommended components that are relevant to Malaita Province are:

1. improving food security for rural villagers
2. enhancing domestically marketed food
3. increasing production of quality copra
4. increasing production of quality cocoa
5. increasing production of virgin coconut oil
7. increasing pig production for the domestic market
8. increasing poultry production for the domestic market
9. facilitating production and sale of indigenous edible nuts
10. stimulating production of chilli for the domestic market
12. stimulating honey production for domestic and export markets.

Food security is an issue in north and west Malaita because of the pressure on land, and the shortening of fallow periods and consequent lower food crop yields. Sale of fresh food is an important activity locally because of the contrasting ecological conditions on the island and ready access to the Honiara market. Similarly, pigs and chickens are sold locally and in the Honiara market by specialist producers. Both copra and cocoa are important sources of cash income on Malaita. There is potential for growing chilli for sale to the Soltai Fishing factory at Noro in Western Province. These issues are discussed in the report on Malaita Province in Volume 4, Chapter 6.

Recommended components that are relevant to the Weather Coast of Guadalcanal Province are:

1. improving food security for rural villagers
3. increasing production of quality copra
4. increasing production of quality cocoa
5. increasing production of virgin coconut oil
6. stimulating village-level food processing for the domestic market
12. stimulating honey production for domestic and export markets.

While the agricultural activities listed here are conducted, or could be conducted, on the Weather Coast of Guadalcanal, their potential is limited by the harsh environment, and implementation will be difficult because of transport constraints and the lack of other supporting infrastructure. These issues are discussed in more detail in the paper on Guadalcanal Province in Volume 4, Chapter 3.

9.6 COMPONENTS AND ACTIVITIES THAT COULD BE FUNDED THROUGH THE COMMUNITY SECTOR PROGRAM

The AusAID-funded Community Sector Program (CSP) could be used as a vehicle to fund most of the recommended activities, depending on the flexibility of the program. In practice, some components and activities are more amenable to funding through the CSP, because of the need for greater inputs by specialists and the greater complexity of some activities. The components and activities (which are

listed under each component in Chapter 10) that could more readily be funded through the CSP are:

1. improving food security for rural villagers, in particular activities 1.1, 1.2, 1.3 and 1.4
2. enhancing domestically marketed food, in particular activities 2.1, 2.2, 2.3, 2.5, 2.6, 2.7, 2.8 and 2.9
3. increasing production of quality copra, in particular activities 3.1 and 3.2
4. increasing production of quality cocoa, in particular activities 4.5 and 4.7
6. stimulating village-level food processing for the domestic market, in particular activities 6.1 and 6.2
10. stimulating production of spices for the domestic and export markets, in particular activities 10.4, 10.5, 10.6, 10.7.

10 Implementation of the components

THIS CHAPTER SETS OUT IN DETAIL THE 13 COMPONENTS OF THE STUDY TO STRENGTHEN RURAL LIVELIHOODS IN SOLOMON ISLANDS (SI).

For each of the components introduced in Chapter 9, the objectives, suggested activities, types of support needed, a discussion of relevant issues and an economic analysis are provided. An indicative cost–benefit analysis for the proposals is given in Appendix 1.1.

10.1 COMPONENT 1 — IMPROVING FOOD SECURITY FOR RURAL VILLAGERS

Objective: To increase the quantity of food produced for subsistence consumption and to reduce variation in supply over time, with a particular focus on the most important food in SI, sweet potato. To increase the capacity of SI scientists to understand and analyse subsistence food production systems, with a particular focus on evaluating the extent, and impact, of shortfalls in subsistence food production.

Activities:

- 1.1 Investigate quarantine requirements for importation of improved plant and animal genetic resources, and protection of SI from exotic pests and diseases.
- 1.2 Introduce and propagate selected varieties of important food crops from elsewhere in the Pacific Islands, in particular from Papua New Guinea (PNG). The main focus will be on sweet potato, but also on selected varieties of taro, cassava, banana, yam and maize (corn).

- 1.3 Multiply planting material at rural training centres (RTCs), schools, government stations and other locations.
- 1.4 Widely distribute planting material to villagers, focusing on women gardeners.
- 1.5 Collect feedback from selected villagers on performance of distributed selected food crop varieties.
- 1.6 Evaluate selected food crop varieties. Agronomists from the Department of Agriculture and Livestock (DAL) and other scientists will evaluate these varieties under controlled conditions.
- 1.7 Do a final evaluation of introduced selected food crop varieties and their impact on food security.
- 1.8 Train two SI food crop agronomists in the agronomy of sweet potato and other staple food crops, including the conducting of assessments of adequacy of subsistence food supply.

Geographical scope: All provinces and islands of SI, with a focus on locations experiencing long-term food security problems.

Duration: Three years, extendable to five years.

Types of support:

- > Support a small technical mission to visit Honiara to make recommendations on how best to re-establish a viable quarantine service so that improved varieties of food and cash crops can be introduced into SI without endangering SI agriculture by introducing exotic pests or diseases.
- > Provide support for the recommendations of the technical mission for implementation of appropriate quarantine procedures.
- > Support DAL food crop agronomists, including field facilities, field experiments, travel, and training.
- > Provide funding for the multiplication of planting material at RTCs and other locations, the distribution of planting material, the collection of information from villagers on the performance of selected varieties.
- > Provide personnel. Inputs would include two DAL agronomists and one expatriate horticulturalist; short-term technical assistance from food crop specialists in PNG.

10.1.1 ISSUES ANALYSIS

There is virtually no quarantine capacity in SI to introduce new cultivars or species of animal or plant from overseas. The issue of quarantine capacity has to be addressed before any new introductions are made to SI. Some of the high-priority recommended components that follow are dependent on the re-establishment of quarantine facilities and procedures, in particular, the introduction of superior varieties of food crops and exotic fruit trees. An effective quarantine service is essential for the development of agriculture in SI.

A long-term need is to generate appropriate technologies for soil fertility maintenance and for village-level pest and disease control. This would require long-term research, and would require a major commitment to create research infrastructure, as well as highly skilled scientists. It is not proposed that such an approach be taken here, given other higher priorities and limited capacity.

10.1.2 ECONOMIC ANALYSIS

It is estimated that around 430 000 tonnes of staple food are produced annually in SI (Table 8.1). This staple food production is equivalent to around 130 000 tonnes of rice in calorie equivalent (based on calculations by Bourke and Vlassak (2004) in PNG). If there was a 1% increase in staple food production as a result of improved planting material being introduced into the country, this would represent around a 4300 tonne increase in staple food production (a caloric equivalent of 1300 tonnes of rice).

The increase in staple food production can be valued in terms of the value of its rice equivalent (see also Section 8.1). In 2004, the average landed value of rice was \$3360 per tonne, with an approximate wholesale value of \$4000 per tonne (a marketing margin of 20%). Thus the value of a 1% increase in staple food production, in rice equivalents, is around \$5.2 million. A 5% increase in staple food production represents a 21 600-tonne increase (6500 tonne rice equivalent). The value of this increase in staple food production is \$26 million.

Comparing benefits with costs: It could be expected that at least a 1% increase in staple food production would be realised from the introduction of improved planting material. Even a 5% increase would seem to be a realistic expectation over a 5–10-year period. The PNG experience has been, and continues to be, a high rate of replacement of older varieties by newer ones that the villagers believe to be superior. Villagers judge superiority on a number of criteria, but one is yield. Based on numerous observations, it is highly likely that the mean yield of sweet potato in PNG is now quite a bit higher than it would have been if villagers had retained their older varieties. This is also true to some extent for yam and taro, but is most notable for sweet potato and banana.

Table 10.1 assumes a 2% increase in staple food production can be achieved over a 10-year period. The benefits from this increase are compared with the costs. The increase in production is shown as occurring in equal increments. The costs are shown as being spread over 3 years, with the largest amount (A\$750 000) spent in the first year. There are no costs incurred after year 3.

It can be expected that the distribution process of the new planting material will continue well beyond year 3. It is assumed that this will be undertaken by the villagers themselves, in the same way that Melanesian villages have acquired improved planting material over the centuries.

These results give an indication of how highly economically beneficial increasing food production in SI will be. Over the 10 years, the benefits exceed the costs by almost A\$10 million. If a 10% rate of discount is applied, the net present value (NPV) is A\$4.7 million. If a 5% rate of discount (probably a better approximation of a longer term social rate of discount) is applied, then the NPV is A\$6 million. The projections from the two components taken together yield an estimated internal economic rate of return (IRR) of 74% over the period. (See footnote 8 for definitions of terms used.)

The component that increases food production is seen to be highly economically viable. Even a modest response over an extended period generates a high rate of return. If there was only a 1% increase in staple food production over a 10-year period, the two proposed components remain economically viable. The NPV rate of interest ($r(i) = 5\%$) is A\$2.7 million and the IRR is 35%. If the production response is 4% over 10 years, exceptionally high economic rates of return are achieved. The NPV ($r(i) = 5\%$) is A\$14.9 million and the IRR is 194%. A 4% increase in staple food production over a 10-year period would not seem to be an excessively optimistic expectation from a program that introduced proven higher-yielding planting material.

Conclusion: It is difficult to envisage a development program that could generate a higher level of economic returns and have the benefits spread more widely throughout the community.

10.2 COMPONENT 2 — ENHANCING DOMESTICALLY MARKETED FOOD

Objective: To increase the quantity and quality of fresh food being sold within SI, with a focus on Honiara and other urban markets; to work with both female and male producers and sellers of food.

Activities:

- 2.1 Propagate and distribute planting material of selected fruit and nut trees in selected locations, with a focus on places with access to urban and other food markets. Fruit trees would include: avocado, carambola (five corner), guava, durian, mango, langsung, lime, Malay apple, mangosteen, mandarin, ngali nut, orange, pomelo, pulasan, 'solo' pawpaw varieties and rambutan. The fruit and nut tree collections established by DAL are a resource that could be used for propagation and distribution of seedlings.
- 2.2 Propagate and distribute selected vegetables and fruit, including temperate climate vegetables for higher altitude locations. Species would include round cabbage, broccoli, carrots, dwarf bean, potato, raspberries and strawberries.
- 2.3 Facilitate the development of private nurseries for propagation and distribution of fruit and vegetable planting material. This would include the development of a management and utilisation plan for the access and sale of DAL tree crop collections.
- 2.4 Encourage the development of farm supply businesses to supply improved seeds and horticultural materials.
- 2.5 Train villagers in off-season pineapple production.
- 2.6 Train villagers and provide information in the production, postharvest handling and marketing of selected vegetables, fruit and nuts for the Honiara and other urban markets.
- 2.7 Train villagers in the safe use of pesticides and other chemicals.

Table 10.1 A comparison of the benefits and costs arising from a 2% increase in staple food production resulting from the implementation of Component 1

YEAR	1	2	3	4	5	6	7	8	9	10
Increase in staple food production from 2004 level (tonnes)	860	1 720	2 580	3 440	4 300	5 160	6 020	6 880	7 740	8 600
Rice equivalent (tonnes)	258	516	774	1 032	1 290	1 548	1 806	2 064	2 322	2 580
Value of rice equivalent (at S\$4000 per tonne)	1 032 103	2 064 206	3 096 310	4 128 413	5 160 516	6 192 619	7 224 722	8 256 826	9 288 929	10 321 032
Benefits (A\$)	206 421	412 841	619 262	825 683	1 032 103	1 238 524	1 444 944	1 651 365	1 857 786	2 064 206
Cost (A\$)	750 000	500 000	250 000							
Benefits – Cost	-543 579	-87 159	369 262	825 683	1 032 103	1 238 524	1 444 944	1 651 365	1 857 786	2 064 206
Total Benefits – Cost over 10 years	9 853 135									
NPV @ r(i) = 10%	4 710 741									
NPV @ r(i) = 5%	6 743 802									
IRR	74%									

NPV = net present value; r(i) = rate of interest; IRR = internal economic rate of return; fob= free on board

Table 10.2 Estimated economic returns for Malaita road rehabilitation component

YEAR	1	2	3	4	5	6	7	8	9	10
Increased copra production (tonnes)	500	1 000	1 500	1 500	1 500	1 500	1 500	1 500	1 500	1 500
Value of increased product (at A\$200 per tonne fob)	100 000	200 000	300 000	300 000	300 000	300 000	300 000	300 000	300 000	300 000
Increased cocoa production (tonnes)	100	200	300	300	300	300	300	300	300	300
Value of increased product (at A\$1500 per tonne fob)	150 000	300 000	450 000	450 000	450 000	450 000	450 000	450 000	450 000	450 000
Brassicas production (tonnes)		50	100	100	100	100	100	100	100	100
Value of production (at A\$1000 per tonne Honiara)	0	50 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000
Total benefits (A\$)	250 000	550 000	850 000	850 000	850 000	850 000	850 000	850 000	850 000	850 000
Cost										
Road rehabilitation equipment						800 000				
Operating costs		200 000	200 000	200 000	200 000	200 000	200 000	200 000	200 000	200 000
Total costs (A\$)		200 000	200 000	200 000	200 000	1 000 000	200 000	200 000	200 000	200 000
Benefits – Costs	-750 000	350 000	650 000	650 000	650 000	-150 000	650 000	650 000	650 000	650 000
Total Benefits – Costs over 10 years (A\$)	4 000 000									
NPV @ r(i) = 10%	2 021 728									
NPV @ r(i) = 5%	2 816 713									
IRR	64%									

NPV = net present value; r(i) = rate of interest; IRR = internal economic rate of return; fob= free on board

- 2.8 Upgrade selected urban marketplaces, including Auki, Noro, Taro, Seghe, Lata, Kirakira and Buala.
- 2.9 Facilitate road rehabilitation and upgrading. Initial emphasis should be on road rehabilitation on Malaita through the existing Community Peace and Restoration Fund (CPRF) road program. It is proposed that a basic pool of second-hand machinery be supplied to the CPRF Malaita community-based road program.
- 2.10 Collect and rapidly disseminate basic price information for the Honiara market (and later for other main provincial markets). Basic shipping cost information also to be provided.

Geographical scope: Focus on north and west Malaita, North Guadalcanal, Savo Island, Nggela, Noro, Seghe and other locations with good access to Honiara market.

Duration: Three years, with possibility of extending to five years after a review.

Types of support:

- > Support for DAL horticulturalists, including field facilities, field experiments, travel, and training.
- > Provide funding for the multiplication of planting material at RTCs and other locations and the distribution of planting material.
- > Provide support for training of selected villagers in production, handling and marketing of selected vegetables, fruit and edible nuts.
- > Produce booklets and other written material on production and marketing of selected vegetables, fruit and edible nuts.
- > Provide personnel. This would include two DAL horticulturalists and one expatriate horticulturalist; and some short-term technical assistance from horticultural specialists.
- > Provide technical assistance to set up market information and dissemination systems (see Volume 3, Appendix 3.8 for details).
- > Construct upgraded marketplaces at selected urban locations.

10.2.1 ISSUES ANALYSIS

Food which is grown and sold within SI is a significant part of total agricultural production. This is particularly the case for the Honiara area, but it is also true for all provinces. Nevertheless, there are a number of factors constraining further production and sales. If these limitations were overcome, there is potential for further sales of food on the domestic market. This potential will increase once the Gold Ridge gold mine and Guadalcanal Plains Palm Oil developments recommence.

The constraints that need to be addressed include provision of selected planting material, provision of farm supply inputs, training of producers in various aspects of production and marketing, upgrading some transport and market infrastructure, and dissemination of timely price and other information to growers.

10.2.2 ECONOMIC ANALYSIS

A significant increase in the production and consumption of fresh food (particularly fruit, vegetables and nuts) is expected as a result of the implementation of this component. Farmers benefit from increased income; employment and income are generated along the marketing chain; consumers save money; and everybody benefits from improved health and nutrition. The nation saves foreign exchange and reduces expenditure on diseases such as diabetes.

Increased fresh food consumption arises from:

- > introduction and distribution of new fruit and vegetables
- > improved quality of fruit and vegetables sold through upgrading of municipal markets and better postharvest handling
- > increased fresh production and better seasonal distribution through better market information and improved technology
- > increased marketing through providing road access.

An indication of the benefits accruing from Component 2 can be gleaned by looking at a number of the specific elements of the component. These are:

- > introduction and distribution of exotic fruit trees
- > introduction and distribution of exotic vegetables
- > encouragement of off-season pineapple production
- > upgrading of market facilities
- > provision of strategically located road access
- > provision of basic market information.

Introduction and distribution of exotic fruit trees:

Based on the experience of other Pacific Island countries, the availability of good quality fruit at a reasonable price can be expected to generate its own demand. Examples are:

- > *Tomatoes in PNG.* PNG now enjoys a high degree of self-sufficiency in tomatoes, with around 1000 tonnes produced annually. A decade ago, a significant proportion of tomatoes sold in PNG supermarkets were imported, with imports then considerably less than current local levels of production.
- > *Hawaiian 'solo' papaya in Fiji.* Hawaiian papaya was introduced to Fiji in the 1980s to develop an export industry. Exports have grown to around 300 tonnes annually, with shipment to New Zealand and Australia. However, double that amount of 'solo' papaya is sold on local markets.
- > *The Samoan Fruit Tree Development Project.* A range of exotic fruit (including rambutan, sweet carambola, avocado, durian, mangosteen and papaya) were introduced by a United Nations Development Programme project with the main objective to develop a fruit export industry. Particular success was achieved with the production of improved rambutan. Rambutan was found to not host Samoan fruit flies and a non-fruit fly–host export protocol was negotiated with New Zealand. However, to date there has been no surplus fruit available for export. The more rambutan that became available, the more it was demanded by local people. A similar situation could be expected in SI for exotic fruits

such as avocado, sweet carambola, guava, durian, mango, langsung, lime, Malay apple, mangosteen, mandarin, orange, pomelo, pulasan, 'solo' papaya and rambutan.

If an additional 500 tonnes only of these fruits were consumed annually, this would represent imputed farmgate value of around \$2 million. If the Samoan experience is anything to go by, the response is likely to be considerably more.

Introduction and distribution of exotic vegetables:

PNG's experience with English cabbage provides an indication of what is achievable with introduced vegetables. In PNG over the last couple of few decades, English cabbage has moved from an exotic import to a staple vegetable consumed throughout the country. English cabbage was previously predominantly a highlands crop. It is now widely distributed throughout the country because of the availability of suitable lowland varieties. A comparable response might reasonably be expected in SI. Cabbages are a comparatively easy crop to grow, provided suitable varieties are readily available, together with information on their production and marketing. A similar result might be expected for bulb onions. The low value of the Solomon Island currency greatly favours the production of such crops.

Component 2 aims to provide farmers with the required technology to produce and market this type of crop.

Encouragement of off-season pineapple production:

From mid-November through to the end of January, pineapples are the main fruit on offer in the market and provide an important source of cash income for farmers from Malaita. For the remainder of the year there are virtually no pineapples available. Through the use of fruiting hormones and appropriate husbandry techniques, pineapples can readily be produced for 10 months of the year. Thus there is the potential to achieve a five-fold increase in the income derived from pineapples. The benefits from this increase would far exceed the cost of transferring this technology.

Upgrading of market facilities: The produce market is the commercial and social epicentre of any Pacific Island community. It is from here that most micro and small-enterprise activities emanate. Investment in municipal market upgrading can provide a major stimulant to small-business development and generate substantial economic and social returns. Produce exposed directly to the hot tropical sun deteriorates rapidly. The wastage can range from 10% to 50% depending on the type of product and the prevailing demand at the time. A major municipal market like Auki might see 300 to 400 tonnes of produce brought to the market on a weekly basis. Better quality produce can be expected to command price premiums over deteriorating produce and induce a significant increase in the volume of produce on offer. Such a supply response was clearly evident for the Honiara market following its upgrading.

Provision of strategically located road access:

Perhaps more than any other investment, strategically located roads are likely to give a high economic rate of return. The returns from the proposed road development on Malaita are likely to be particularly high. The benefits are not only in expanded trade, but also in sustainable long-term land use and food security. Population pressure could be relieved by construction of roads to the centre of the island and the east coast, so that food and cash-crop production could expand and relieve pressure on currently used land. A similar response might be expected from the rehabilitation of the Bursrata road to service Central Malaita. Higher elevation areas in Central Malaita have been identified that would be well suited for the growing of brassica crops and other temperate vegetables for the Auki market and for on-shipment to Honiara. The study recommends that a basic pool of machinery (second-hand) be supplied to the CPRF Malaita road rehabilitation program to significantly enhance its capability. The estimated cost of this machinery is A\$800 000. Only a modest production response to this road rehabilitation investment is necessary to generate a high rate of economic return. For example, if the road program resulted in a 10% increase in copra and cocoa production and 100 tonnes of brassicas produced

annually, the estimated net present value (NPV) from the investment over 10 years would be A\$2.8 million ($r(i) = 5\%$), with an IRR of 64% (Table 10.2). The actual returns from the investment in road rehabilitation on Malaita are likely to be considerably higher when account is taken of the following:

- > the increase in copra and cocoa production might reasonably be expected to be higher than has been estimated above
- > brassicas are used as a proxy for the increase in fresh food marketing; no allowance has been made for increased marketing of basic staples, which can be expected to increase significantly
- > conventional analysis of road projects concentrates on benefits such as reduced travelling time and reduced wear and tear on vehicles; no account of these benefits has been taken here
- > there would be considerable benefits in the form of significantly improved access to basic services, particularly medical and educational services
- > there will be significant subsistence consumption and food security benefits.

Provision of basic market information: An efficient marketing system depends on the free flow of accurate information between sellers and buyers. Farmers need to know who the buyers are, their quality requirements, and prices on offer. If market information can be cost-effectively provided, it has significant positive benefits for the agricultural community (see Volume 3, Appendix 3.8 for details of the proposed market information system).

10.3 COMPONENT 3 — INCREASING PRODUCTION OF QUALITY COPRA

Objective: To increase exports of quality copra from SI and to get cash income into the hands of as many rural villagers as possible.

Activities:

- 3.1 Provide steel flues for construction of copra dryers for carefully selected recipients.

- 3.2 Provide a small once-off injection of working capital for buying agents in more remote locations. The identified areas include the Shortlands, north New Georgia, western Isabel and the Weather Coast of Guadalcanal.¹⁰

Geographical scope: All provinces of SI, except for Rennell and Bellona.

Duration: Two years.

Types of support:

- > Provide components for construction of copra dryers in selected locations.
- > Provide financial support through provision of once-off capital to selected copra buyers in remote locations.
- > Re-establish a small coconut seed garden network for the distribution of improved planting material (possibly selected Solomon Tall and Solomon Tall x Rennell Tall hybrids) for coconut replanting.

10.3.1 ISSUES ANALYSIS

Copra production has increased in SI, but production levels are still below the pre-tension period and very much less than the potential. Copra is the most widely grown cash crop. Support for the copra industry has the potential to increase cash incomes of more rural villagers than other any single activity.

The widespread adoption of steel pipes in copra dryers will improve copra quality and reduce the wastage of firewood in copra drying. The flue is the key component in the dryer, and it cannot be substituted with other materials. However, it is not readily available to farmers. Farmers who have already taken the initiative to rehabilitate their dryers using second-hand oil drums should be given priority in the distribution program. For these farmers, a new steel flue would be a welcome 'upgrade' to reward initiative already taken. A priority location for the distribution of steel flues should be Malaita, particularly around the North

Malaita Tiny Tech copra oil mill which is suffering from the lack of quality copra availability.

The limiting factors are credit for buyers and an insufficient number of copra dryers. Two activities are proposed here to help overcome these limitations and to 'kick start' copra production in more remote copra producing locations. Lack of working capital is limiting purchase of copra by buyers. It is proposed to provide a once-off grant to selected buyers, identified by Commodities Export Marketing Authority (CEMA) staff.

Since the mid-1980s there has been very little systematic planting of coconuts. Without substantial replanting over the next decade or so, the mean age distribution of the SI coconut palms will shift more to those that are entering a declining production phase. Hence the recommendation for the establishment of a small coconut seed garden network for the distribution of improved planting material.

10.3.2 ECONOMIC ANALYSIS

The successful implementation of this component will result in an overall improvement in the volume and quality of copra production. Models are used to simulate the impact of various copra production increases and price premiums due to quality improvements. The base level of production is 25 000 tonnes at a fob price of \$200 per tonne. Three different scenarios modelled are:

- > *Model 1:* a 5% increase in production over a 10-year period and a 5% price premium for improved quality starting from year 1.
- > *Model 2:* a 5% increase in production over a 10-year period and a 15% price premium for improved quality starting from year 1.
- > *Model 3:* a 15% increase in production over a 10-year period and a 15% price premium for improved quality starting from year 1.

Comparing benefits with costs: Table 10.3 compares the benefits with the costs for the three models. Model 1 is not viable, with its low production

¹⁰ The proposal is for three months working capital, provided in three monthly instalments. Each instalment is paid on evidence that 10 tonnes of stock has been accumulated by the trader.

Table 10.3 Comparing costs and benefits from increasing the production of quality copra

YEAR	1	2	3	4	5	6	7	8	9	10
Model 1: a 5% increase in production over 10 years and a 5% price premium for improved quality										
Total benefit (A\$)	276 250	302 500	328 750	355 000	381 250	407 500	433 750	460 000	486 250	512 500
Costs										
Provision of steel flues	450 000	500 000								
Injection of working capital	400 000									
Hybrid coconut seed garden	618 000	618 000	618 000							
Total cost	1 468 000	1 118 000	618 000							
Benefits – Cost	-1 191 750	-815 500	-289 250	355 000	381 250	407 500	433 750	460 000	486 250	512 500
Total Benefits – Cost over 10 years	739 750									
NPV @ r(i) = 10%	-424 491									
NPV @ r(i) = 5%	17 990									
IRR	0.05%									
Model 2: a 5% increase in production over 10 years and a 15% price premium for improved quality										
Total benefit (A\$)	778 750	807 500	836 250	865 000	893 750	922 500	951 250	980 000	1 008 750	1 037 500
Total cost (A\$)	1 468 000	1 118 000	618 000							
Benefits – Cost	-689 250	-310 500	218 250	865 000	893 750	922 500	951 250	980 000	1 008 750	1 037 500
Total Benefits – Cost over 10 years	5 877 250									
NPV @ r(i) = 10%	2 720 383									
NPV @ r(i) = 5%	3 977 292									
IRR	48%									
Model 3: a 15% increase in production over 10 years and a 15% price premium for improved quality										
Total benefit (A\$)	828 750	915 000	1 001 250	1 087 500	1 173 750	1 260 000	1 346 250	1 432 500	1 518 750	1 605 000
Total costs (A\$)										
Benefits – Cost	-639 250	-203 000	383 250	1 087 500	1 173 750	1 260 000	1 346 250	1 432 500	1 518 750	1 605 000
Total Benefits – Cost over 10 years	8 964 750									
NPV @ r(i) = 10%	4 343 863									
NPV @ r(i) = 5%	6 183 371									
IRR	67%									

NPV = net present value; r(i) = rate of interest; IRR = internal economic rate of return; fob = free on board

increase (5% over 10 years) and a small quality premium (5% overall). If a reasonable price premium results from an improvement in quality, then a high economic return is achieved. In model 2, there is a 15% overall price premium and small increase in production over a 10-year period. This generates a A\$4 million NPV ($r(i) = 5\%$) and IRR of 48%. Given the high price discounts that poor quality copra incurs, a 15% overall price premium resulting from the widespread adoption of steel flues for drying would be a reasonable expectation. Quality flue-dried copra can be used for virgin coconut oil production, thereby increasing the overall price premium obtainable. If overall copra production increases by 15% over a 10-year period, the rates of return increase significantly (NPV = A\$6.1 million and IRR = 67%). A 15% increase in copra production over a 10-year period would seem a conservative response from a component that increases grower prices, provides working capital for remote locations and makes available improved coconut planting material.

Conclusion: Only modest improvements are required to economically justify the proposed intervention to increase the production of quality copra.

10.4 COMPONENT 4 — INCREASING PRODUCTION OF QUALITY COCOA

Objective: To increase cocoa exports from SI.

Activities:

- 4.1 Train cocoa growers in rehabilitation of village and former plantation cocoa plots.
- 4.2 Produce booklets and other written material on production and processing of cocoa.
- 4.3 Introduce improved cocoa planting material from the Papua New Guinea Cocoa and Coconut Institute.
- 4.4 Increase land use efficiency with cocoa by demonstrating multispecies use of land with cocoa and other economic crops.
- 4.5 Upgrade fermentaries through the provision of steel flues.

- 4.6 Facilitate the introduction of certified organic cocoa production.
- 4.7 Rebuild the centralised cocoa facility at Marasa on the Weather Coast of Guadalcanal.

Geographical scope: Guadalcanal (including the Weather Coast), Malaita, Makira, Isabel, Central, Western and Choiseul provinces.

Duration: Four years.

Types of support:

- > Include steel flues for cocoa dryers as part of the cocoa dryer improvement program.
- > Provide financial support to train cocoa growers in rehabilitation, production and processing.
- > Provide financial support to import improved and black pod-resistant planting material (SG2 hybrids) from the Papua New Guinea Cocoa and Coconut Institute; assist the private sector in the construction of nurseries, the propagation of seedlings of improved material, and the distribution of seedlings to cocoa growers.
- > Provide personnel. This would include two DAL cocoa specialists and an expatriate cocoa specialist.
- > Provide short-term technical assistance from PNG for cocoa intercropping demonstration.
- > Provide support to organically certify cocoa.

10.4.1 ISSUES ANALYSIS

This component needs to be designed in more detail as there are a number of technical issues involved with the introduction of improved planting material. There is the possibility of adoption of the 'mini-fermentation boxes' that are now being widely used in parts of PNG where cocoa production is limited. The use of steel flues is necessary to improve cocoa quality.

10.4.2 ECONOMIC ANALYSIS

Observation, and discussion with industry, suggest that the overall cocoa production loss from black pod disease is in the order of 30% to 40%. At a current production level of 5000 tonnes, this represents an annual loss of 1500 to 2000 tonnes of cocoa annually. A combination of improved cocoa husbandry and the widespread adoption of new black pod-resistant planting material from Papua New Guinea could halve these losses over a 10-year period.

The main benefits are to be achieved through improvements in quality. SI cocoa is often characterised by poor fermentation (under-fermentation) and smoke contamination. Such cocoa can expect to receive around A\$100 per tonne discount, depending on the prevailing price at the time. The distribution of steel flues and the processing training program address these cocoa quality issues. It is assumed that these activities can reduce the overall quality discount by half over a six-year period. The introduction of organic certification will mean price premiums for those participating farmers. It is assumed that organic certification results in a A\$25 per tonne increase in the overall cocoa price. The overall price benefit from the interventions is put at A\$75 per tonne, which is reached over a three-year period.

Comparing benefits with costs: Table 10.4 compares the benefits with the costs of achieving the projected improvement in cocoa production and quality. If these relatively modest improvements are achieved, the economic viability of the cocoa component is high, with a NPV of A\$7.5 million ($r(i) = 5\%$) and IRR of around 100%. These results suggest that a program to improve the production of quality cocoa provide a higher economic return than any other component of the recommendations.

10.5 COMPONENT 5 — INCREASING PRODUCTION OF VIRGIN COCONUT OIL

Objective: To increase the production of virgin coconut oil for domestic and export markets, with an emphasis of increasing the viability of existing operations.

Activities:

- 5.1 Provide support for a promotional campaign on the local market to encourage the increased use of edible coconut oil.
- 5.2 Provide marketing support.
- 5.3 Facilitate the improvement in copra quality.
- 5.4 Provide targeted infrastructure support.

Geographical scope: Guadalcanal (including the Weather Coast), Malaita, Makira, Isabel, Central, Western and Choiseul provinces.

Duration: Four years.

Types of support:

- > Assist in the preparation of advertising campaigns and promotion materials to increase the local consumption of edible oil.
- > Provide organisational and financial assistance to obtain and maintain organic certification of virgin coconut oil (this would be combined with organic cocoa).
- > Assist in the preparation and use of websites for niche export marketing.
- > Distribute steel flues for copra dryers in locations where cold press copra mills have been established.
- > Assist in the identification of export market buyers.
- > Construct a small jetty at Malu'u on north Malaita to facilitate the transportation of oil from the cold press mill.

Table 10.4 Comparing costs and benefits from increasing the production of quality cocoa

	1	2	3	4	5	6	7	8	9	10
Total Benefits (A\$)	125 500	438 500	756 750	945 750	1 134 750	1 323 750	1 512 750	1 701 750	1 890 750	2 079 750
Costs (A\$)										
– steel flues for cocoa driers	115 000									
– training	50 000	50 000	50 000							
– support for import of black pod resistant material	100 000	50 000	50 000	50 000						
– technical assistance for inter-cropping	50 000	50 000								
– specialist cocoa expertise	205 000	205 000								
– support for organic certification	31 250	31 250								
Total costs	551 250	386 250	100 000	50 000						
Benefits – Costs	–425 750	52 250	656 750	895 750	1 134 750	1 323 750	1 512 750	1 701 750	1 890 750	2 079 750
Total Benefits – Costs over 10 years (A\$)	10 822 500									
NPV @ r(i) = 10%	5 387 040									
NPV @ r(i) = 5%	7 545 561									
IRR	105%									

NPV = net present value; r(i) = rate of interest; IRR = internal economic rate of return; fob = free on board

10.5.1 ISSUES ANALYSIS

The production of virgin coconut oil offers considerable promise for significant value adding and diversification in the industry. The priority requirement for realising this potential is to increase the financial viability of existing operations. This involves increasing the price received by growers and reducing their cost of operation.

10.5.2 ECONOMIC ANALYSIS

The *Markets and Marketing Issues* report (Volume 3) concluded that the production of virgin coconut oil offers considerable promise for significant value adding and diversification in the industry. The priority requirement for realising this potential is to increase the financial viability of existing operations. This involves increasing the price received by growers and reducing their cost of operation. If this can be achieved, a virgin oil industry equivalent to around 5% of current copra production is achievable (around 750 000 litres). High quality virgin coconut oil should be able to command a fob/wholesale price of around \$15 per litre.

Comparing benefits with costs: The emphasis of this component is directed at achieving a price level required for a substantial viable industry. The cost of this component is A\$345 000 spent over two years, with the expectation that this will result in the development of an industry with an annual added value exceeding A\$1 million.

10.6 COMPONENT 6 — STIMULATING VILLAGE-LEVEL FOOD PROCESSING FOR THE DOMESTIC MARKET

Objective: To provide viable income-earning opportunities for isolated economically marginal communities.

Activities:

- 6.1 Develop and trial technologies using locally grown crops. Priority products identified are peanuts (roasted, raw with testa removed), chips (banana, taro and breadfruit) dehydrated fruit, and dehydrated cutnut.

- 6.2 Pilot and demonstrate the feasibility of producing and marketing processed foods for the domestic market.
- 6.3 Facilitate the linkages between producers and private sector marketers.

Geographical scope: Selected isolated locations, including the Weather Coast of Guadalcanal.

Duration: Three years.

Types of support:

- > Provide ongoing technical support to the Kastom Gaden Association (KGA) in food processing initiatives.
- > Make technical food processing advice available to both farmers and private sector buyers and marketers. Advice on packaging has been identified as a priority need.
- > Produce simple pictorial food processing manuals.
- > Facilitate linkages between producers and marketers.
- > Provide marketing and business advice for small-scale processing operations.
- > Provide training to successful small-scale operations in other Pacific Island countries.

10.6.1 ISSUES ANALYSIS

KGA has provided successful once-off technical assistance to village producers on the Weather Coast of Guadalcanal and Makira. However, to have sustained benefits, there needs to be an ongoing program of inputs, and technical advice needs to be made available at all stages in the marketing chain.

10.6.2 ECONOMIC ANALYSIS

Specific outcomes of this initiative are difficult to predict. However, some outcomes targeted by this component include:

- > cutnuts being processed and packaged on the Guadalcanal Weather Coast and sold in Honiara

- > banana and breadfruit chips being processed and packaged on the Weather Coast (and other locations) and sold in Honiara
- > villagers supplying a significant volume of roasted peanuts to Honiara and other centres
- > good-quality locally roasted coffee being available in Honiara.

Comparing benefits with costs: The long-term income and distributional benefits from outcomes would well justify the estimated cost of this investment. The economic benefits can be measured in terms of value added. The estimated cost of this component is A\$235 000 per year for three years. Simulations were conducted to determine the value-added increases necessary to achieve a positive IRR. If the value-added increase achieved in the first year was A\$40 000, and increased by A\$10 000 for the next nine years, then the IRR would be 4%. The initial achievements of AusAID's village-processing efforts on the Guadalcanal Weather Coast suggest that a better level of performance might be expected.

10.7 COMPONENT 7 — INCREASING PIG PRODUCTION FOR THE DOMESTIC MARKET

Objective: To improve the productivity of pigs in subsistence and small-scale commercial systems throughout SI; to improve participation of smallholder pig farmers in supplying commercial markets in the provincial capitals and Honiara; and to re-establish medium-scale pig production units on Guadalcanal and Malaita.

Activities:

- 7.1 Develop technical capacity in DAL, RTCs and NGOs for delivery of technical support to subsistence and commercial pig farmers.
- 7.2 Develop appropriate feeding and husbandry practices based on local best practice for subsistence producers.
- 7.3 Develop capacity for regular technical follow-up visits.
- 7.4 Develop feeding strategies using locally available feeds and byproducts and imported supplements for commercial producers.
- 7.5 Utilise expert knowledge to augment local best practice.
- 7.6 Develop financial management information for pig production systems.
- 7.7 Facilitate the establishment of registered slaughter houses and provide a fee-for-service meat inspection system.
- 7.8 Determine minimum standards for effluent management.
- 7.9 Provide effective quarantine to prevent the entry of exotic pests and diseases and enable the importation of semen for improved breeding lines.

Geographical scope: Improved subsistence and small-scale commercial production in all provinces. Small and medium-scale commercial pig production in Guadalcanal and Malaita.

Duration: Five years with stop/go review at three years.

Types of support:

- > Engage DAL national and provincial livestock extension officers, together with KGA or other NGOs, to conduct benchmarking activities within local communities, provide technical information on husbandry and feeding systems, conduct regular follow-up visits; introduce new ideas; facilitate articulation of subsistence production into commercial production where appropriate and facilitate communication and understanding between suppliers and buyers.
- > Engage a mixture of local DAL staff and consultants to develop a range of appropriate extension and training materials.
- > Engage a mixture of local DAL staff and consultants (from Melanesia or with local experience) to provide training in business management specifically related to pig production.
- > Collaborate with the Australian Centre for International Agricultural Research (ACIAR) to develop commercial feeds from locally available feeds and byproducts, and imported supplements.

- > Build small-scale slaughter houses as needed, using standard plans (available through the Secretariat of the Pacific Community; SPC).
- > DAL and health inspectors to undertake annual audit of effluent management systems in peri-urban piggeries.
- > Negotiate support from SPC regarding up-to-date animal disease survey and review of quarantine protocols.

10.7.1 ISSUES ANALYSIS

There is a substantial, under-supplied, domestic market for pork and pig products. Far greater use needs to be made of domestic feed sources to maximise the value-added benefits from supplying this market.

10.7.2 ECONOMIC ANALYSIS

SI is virtually self-sufficient in pig meat, with the value of production estimated at around \$120 million. There is huge scope to expand consumption by increasing availability and reducing prices. The weaning and subsequent growth rates of native pigs can be increased by 80% and 50%, respectively, through the adoption of improved feeding and management systems. Growth rates can be improved by up to 100%, by introducing European breeds to produce crossbred pigs to replace native pigs. The cumulative benefits of the widespread adoption of these improvements would be considerable. The value added could be further increased through better utilisation of locally available feed. The economic contribution of the proposed pig component is expected to be significantly more than the A\$600 000 proposed to be spent over two years.

10.8 COMPONENT 8 — INCREASING POULTRY PRODUCTION FOR THE DOMESTIC MARKET

Objective: To improve the productivity of subsistence poultry systems throughout SI; to improve participation of smallholder poultry farmers in supplying commercial markets in the provincial capitals and Honiara; and to re-

establish medium-scale poultry production units on Guadalcanal.

Activities:

- 8.1 Develop technical capacity in DAL, RTCs and NGOs for delivery of technical support to subsistence and commercial poultry farmers.
- 8.2 Provide technical information on husbandry and feeding systems through short courses, field visits, technical notes and posters.
- 8.3 Develop capacity for regular technical follow-up visits.
- 8.4 Develop feeding strategies for dual-purpose and hybrid poultry using locally available feeds and byproducts and imported supplements for commercial producers.
- 8.5 Develop financial management information for poultry production systems.
- 8.6 Facilitate communication and understanding between producers and buyers.
- 8.7 Facilitate articulation of subsistence production into commercial production where appropriate.
- 8.8 Provide effective quarantine to prevent the entry of exotic pests and diseases and enable the importation of improved breeding lines.

Geographical scope: Improved subsistence and small-scale commercial production in all provinces. Small and medium-scale commercial production in Guadalcanal and Malaita.

Duration: Five years with stop/go review at three years.

Types of support:

- > Engage DAL national and provincial livestock extension officers, together with KGA or other NGOs, to conduct benchmarking activities within local communities, provide technical information on husbandry and feeding systems, conduct regular follow-up visits; introduce new ideas; facilitate articulation of subsistence production into commercial production where appropriate and facilitate communication and understanding between suppliers and buyers.

- > Engage a mixture of local DAL staff and consultants to develop a range of appropriate extension and training materials.
- > Engage a mixture of local DAL staff and consultants (from Melanesia or with local experience) to provide training in business management specifically related to poultry production.
- > Collaborate with ACIAR to develop commercial feeds from locally available feeds and byproducts, and imported supplements, and to evaluate dual-purpose production systems.
- > Negotiate support from SPC regarding up-to-date animal disease survey and review of quarantine protocols.

10.8.1 ISSUES ANALYSIS

Significant volumes of poultry products are still imported. To maximise the value-added benefits from import substitution, far greater use needs to be made of domestic feed sources.

10.8.2 ECONOMIC ANALYSIS

The *Livestock development* report (Volume 2, Chapter 2) imputes the value of village poultry production to be \$5 million. Simple husbandry and the expanded use of dual-purpose birds (meat and eggs) would greatly increase this value. Improved viability of commercial poultry production is dependent on the utilisation of higher quality local feeds at a lower cost than imported feeds.

There is a particularly high demand for eggs, reflected in the high level of egg imports, averaging 135 000 dozen over the period 2001–2003. With the restoration of greater normality to the economy, it is likely that these imports now exceed 150 000 dozen. A shortage of eggs was noted in Honiara and the provincial centres. The economic contribution of the proposed poultry component is expected to be significantly more than the A\$600 000 proposed to be spent over two years.

10.9 COMPONENT 9 — FACILITATING PRODUCTION AND SALE OF INDIGENOUS EDIBLE NUTS

Objective: To facilitate the domestic and overseas marketing of indigenous edible nuts and nut products.

Activities:

- 9.1 Identify private enterprise purchasers and processors of indigenous edible nuts and provide assistance.
- 9.2 Facilitate the transfer of appropriate ngali nut-cracking technology to SI.
- 9.3 Assist with the transfer to SI of Vanuatu private sector experience in developing the indigenous nut business.
- 9.4 Facilitate support for the market supply chain of nuts to purchaser/processor.
- 9.5 Establish a pilot processing and production unit at a subprovincial level utilising the private sector.
- 9.6 Investigate commercial on-farm processing and storage technologies.
- 9.7 Promote indigenous nuts to encourage substantial agribusiness investment in industry development.

Geographical scope: Initial focus Malaita and Nggela (Central province); with later focus on Makira Province, Western Province and the Weather Coast of Guadalcanal (for cutnut).

Duration: Three to five years.

Types of support:

- > Develop business skills and provide technical assistance and information to private enterprise buyers and processors of nuts, including the transfer of technology and expertise from Vanuatu and Papua New Guinea.
- > Provide financial and information support to CEMA to promote and facilitate the supply of nuts to private buyers. In keeping with CEMA's new role, this will not involve the direct buying or selling of nuts.

- > Provide technical and capacity building assistance to regional (multipurpose) primary processing and storage units.
- > Provide technical assistance for development, testing and promotion of on-farm processing and storage technologies.
- > Develop a pilot microenterprise project for processing and packaging of substantial cutnut resource on the Guadalcanal Weather Coast.

10.9.1 ISSUES ANALYSIS

SI has large stocks of indigenous nuts, such as ngali nut (*Canarium* spp) and cutnut (*Barringtonia* spp), with commercial potential. Private sector enterprise and investment in SI is weak. There is a need to encourage and support private sector investment in processing and marketing of indigenous nuts, to help establish and stimulate supply chains to private buyers, and to help develop and pilot on-farm and regional value-adding initiatives.

10.9.2 ECONOMIC ANALYSIS

Major development of the indigenous tree nut industry will require investment on a similar scale to that which has gone into the oil palm industry in recent decades. The end result could well be an industry of equivalent importance. Until such investment is forthcoming, there are opportunities for much smaller-scale development of the magnitude that has occurred in Vanuatu. A Vanuatu-scale commercial nut industry would be worthwhile in its own right, and would justify the proposed expenditure of some A\$500 000. The demonstrated success of this component could provide the catalyst for the agribusiness investment required for a major industry.

10.10 COMPONENT 10 — STIMULATING PRODUCTION OF SPICES FOR THE DOMESTIC AND EXPORT MARKETS

Objective: To assist the development of vanilla as an export cash crop in agronomically suitable areas; to re-establish production and supply lines of chilli for use in the production of ‘chilli tuna’ by the Soltai cannery.

Activities:

- 10.1 Provide support for restocking and propagation of planting material of vanilla in North Guadalcanal.
- 10.2 Train selected growers in production and processing techniques for vanilla in North Guadalcanal.
- 10.3 Facilitate the purchase and distribution of the recently published *Vanilla: Agriculture and Curing Techniques. A Photographic Handbook for Vanilla Farmers* (Bianchessi 2004).
- 10.4 Increase planting material for chilli production for the Soltai Fishing and Processing Ltd factory at Noro.
- 10.5 Train villagers in postharvest handling and drying of chillies.
- 10.6 Prepare a ‘Pictorial Manual on the Growing, Post-Harvest Handling and Drying of Chillies in SI’.
- 10.7 Support and assist Soltai, DAL, CEMA and growers to re-establish chilli supply chains by promotion of chilli production and development of provincial grower groups.

Geographical scope: Vanilla on North Guadalcanal only;¹¹ chillies in Western Province and north Malaita.

Duration: Short to medium (1–3 years).

11 This could be extended to other locations if it was established that flowering occurs successfully there.

Types of support:

- > Train and provide technical assistance for planting material propagation, vanilla processing and chilli postharvest handling.
- > Provide appropriate training materials.
- > Provide grants for promotion (information and awareness).

10.10.1 ISSUES ANALYSIS

Vanilla is a specialised crop that can provide good income to selected growers in those areas where it grows well (North Guadalcanal), and has a future as a long-term industry if it is produced as an A-grade crop. There are a number of issues that require close attention, the most important being processing by producers.

Support for chillies is limited to satisfying the domestic market of 500–1000 kg per year for the Noro fish cannery, by providing seed and helping re-establish supply chains. Exporting of chillies is not considered feasible in the short to medium term.

10.10.2 ECONOMIC ANALYSIS

SI could be exporting 2 tonnes of vanilla within five years, as a result of the proposed intervention. At a modest fob price of A\$80 per kg this would represent an industry with an annual export value of A\$160 000. This compares with the estimated cost of the proposed intervention of A\$150 000.

The *Markets and Marketing Issues* report (Volume 3) identified a currently available market for 10 tonnes of good-quality dried chillies for the production of ‘chilli tuna’. The price on offer to farmers is \$50 per kg. An industry valued at \$500 000 could be readily achievable within a few years. This would represent an excellent rate of return on a proposed expenditure of around A\$150 000.

10.11 COMPONENT 11 — INCREASING BEEF CATTLE PRODUCTION FOR THE DOMESTIC MARKET

Objective: To re-establish smallholder cattle production in provinces for supply of beef to commercial markets in the provincial capitals and Honiara.

Activities:

- 11.1 Support establishment of networks of provincial cattle farmers.
- 11.2 Provide appropriate training and extension materials, making use of capacity and resources in Vanuatu.
- 11.3 Facilitate communication and understanding between suppliers and buyers.
- 11.4 Provide training in business management specifically related to beef cattle production.
- 11.5 Facilitate positive interactions between large estate producers and smallholders.
- 11.6 Provide an effective quarantine system to prevent the entry of exotic pests and diseases.

Geographical scope: Improved subsistence in all provinces, with additional emphasis on Guadalcanal, Yandina and Malaita.

Duration: Five years with stop/go review at three years.

Types of support:

- > Provide transport for DAL livestock officers to deliver technical support and facilitate establishment of producer networks.
- > Engage a mixture of local DAL staff and consultants (from Melanesia or with local experience) to develop a range of appropriate extension and training materials.

10.11.1 ISSUES ANALYSIS

The potential for re-establishment of estate sector cattle production is required, as this will determine the future importance of the beef cattle industry in national terms.

10.12 COMPONENT 12 — STIMULATING HONEY PRODUCTION FOR DOMESTIC AND EXPORT MARKETS

Objective: To support the continued development of honey production for supply of local and export markets, and to increase the number of people involved in the industry.

Activities:

- 12.1 Provide training through DAL, RTCs and NGOs, using appropriate extension materials.
- 12.2 Prepare a 'Pictorial Manual of Honey Production in SI'.
- 12.3 Provide support to DAL, RTCs and NGO experts to undertake field support and follow-up training of existing producers.
- 12.4 Assist the re-establishment of the Honey Association following the ethnic tension.
- 12.5 Assist with the provision of organic certification for honey producers targeting export markets.

Geographical scope: Focus development on Malaita, where honey production is currently centred, and in disadvantaged regions with few alternative sources of income generation (eg Rennell and Bellona Province).

Duration: Five years with stop/go review at three years.

Types of support:

- > Supply small amounts of equipment support for young producers who have shown initiative in honey production through attending training courses and other means.

- > Support continuing technical assistance to small-scale honey producers from DAL, RTC and NGO experts.
- > Engage local and expatriate consultants as required to develop appropriate training materials for small-scale honey producers. This would include preparation of a pictorial manual.
- > Provide a one-off cash grant to re-establish the facilities of the Honey Association.

10.12.1 ISSUES ANALYSIS

This component should proceed only if the risks posed by the spread of the Asian bee are manageable.

10.13 COMPONENT 13 — STIMULATING COMMERCIAL DEVELOPMENT OF NONTIMBER FOREST PRODUCTS FROM INDIGENOUS SPECIES

Objective: To develop long-term appropriate and sustainable diversification of SI agriculture.

Activities:

- 13.1 Develop in-country multidisciplinary skills for the participatory and technical identification and assessment of indigenous nontimber forest and agroforest products with commercial potential.
- 13.2 Trial the identification and assessment process at the community, provincial and national level.
- 13.3 Support the local, provincial and national commercial development and marketing of products with high potential.

Geographical scope: National, local and provincial, with the sites to be determined.

Duration: Three to five years.

Types of support:

- > Provide training, technical assistance and capacity building for the identification and assessment process.

- > Provide financial assistance for field trials.
- > Provide technical and financial assistance for commercial development and marketing.

10.13.1 ISSUES ANALYSIS

Indigenous multipurpose tree species (eg coconut) grown in multispecies agroforest systems are more appropriate for SI conditions. New markets and multidisciplinary methodologies can now assist stakeholders to identify and match potential products with markets, and help steer progressive development and marketing. Training, technical assistance and capacity building are required to assist SI conduct this process, help fund development of new products, and hence help diversify agriculture and resource use. Technical and training assistance is required to enable stakeholders from a range of disciplines in SI to conduct market assessment and analysis on a local, provincial and national level. Technical and capacity building assistance is also needed to assist the progressive development of products and markets with high potential.

Appendix 1.1: An indicative cost–benefit analysis of the recommended components

The 13 recommended components for improving rural livelihoods and generating broad-based growth in Solomon Islands (SI) may be classed as being of high, medium and lower priority. The groupings are:

> High-priority components

- 1a. Investigation of import quarantine needs for SI agriculture
- 1b. Improving food security for rural villagers
2. Enhanced domestically marketed food
3. Increased production of quality copra
4. Increased production of quality cocoa

> Medium-priority components

5. Increased production of virgin coconut oil
6. Village-level food processing for the domestic market
7. Increased pig production for the domestic market
8. Increased poultry production for the domestic market
9. Production and sale of indigenous edible nuts
10. Production of spices for the domestic and export markets

> Lower-priority components

11. Increased beef cattle production for the domestic market

12. Honey production for domestic and export markets
13. Commercial development of nontimber forest products from indigenous species.

The indicative costs and projected expected benefits from implementation are presented below for the high- and medium-priority components.

1.1 COMPONENT 1A: INVESTIGATION OF IMPORT QUARANTINE NEEDS FOR SOLOMON ISLANDS AGRICULTURE AND COMPONENT 16: IMPROVING FOOD SECURITY FOR RURAL VILLAGERS

The cost and benefits of these two inter-related components are evaluated together.

1.1.1 COMPONENT 1a OBJECTIVE

To investigate what is needed to re-establish a quarantine service that can facilitate germplasm transfer to improve Solomon Islands (SI) agriculture.

Type of support envisaged:

- > Support a small technical mission to visit Honiara to make recommendations on how best to re-establish a viable quarantine service so that improved varieties of food and cash crops can be introduced into SI without endangering SI agriculture by introducing exotic pests or diseases.

- > Provide support for the recommendations of the technical mission for implementation of appropriate quarantine procedures.

1.1.2 COMPONENT 16 OBJECTIVE

To increase the quantity of food produced for subsistence consumption and to reduce variation in supply over time, with a particular focus on sweet potato, the most important food in SI.

To increase the capacity of SI scientists to understand and analyse subsistence food production systems, with a particular focus on evaluating the extent and impact of shortfalls in subsistence food production.

Type of support envisaged

- > Introduce and propagate selected varieties of important food crops from elsewhere in the Pacific Islands, in particular from Papua New Guinea (PNG). The main focus will be on sweet potato, but also on selected varieties of taro, cassava, banana, yam and maize (corn).
- > Increase planting material at rural training centres (RTCs), schools, government stations and other locations.
- > Widely distribute planting material to villagers, focusing on women gardeners.
- > Collect feedback from selected villagers on performance of distributed varieties.
- > Evaluate varieties by Department of Agriculture and Livestock (DAL) agronomists and other scientists under controlled conditions.
- > Complete a final evaluation of introduced varieties and their impact on food security.
- > Train two SI food crop agronomists in the agronomy of sweet potato and other staple food crops, including conducting assessments of adequacy of subsistence food supply.

1.1.3 INDICATIVE COSTS

Component 1a

Consultancy inputs for the technical mission include an estimated one month of international specialist technical assistance (TA) and one month of local specialist TA. For budgeting purposes, short-term international TA is costed at \$50 000/month (includes consultancy fees, international and local travel cost, per diem and overhead costs). Local TA inputs are costed at \$15 000/month (includes fees, local travel and per diem). The total cost of this investigation will be \$65 000.

It can be expected that the mission will recommend the re-establishment of some modest and appropriate postentry quarantine facility. A provision of \$300 000 is made for this purpose.

Costs will also be incurred in the assembly and transportation of the planting material. An allowance of \$50 000 is provided for this.

Component 1b

Support will be provided for DAL food crop agronomists, including field facilities, field experiments, travel and training. There will be costs for multiplication of planting material at RTCs and other locations, distribution of planting material and collection of information from villagers on the performance of selected varieties. Personnel inputs will include two DAL agronomists and one expatriate horticulturalist, and short-term TA from food crop specialists in PNG. The total cost of all these component elements will be approximately \$1.33 million, spent over a three-year period.

Table A1.1.1 shows the cost breakdown for the various identified types of support (for both components 1a and 1b).

1.1.4 PROJECTED BENEFITS FROM COMPONENTS 1a AND 1b

It is estimated that around 430 00 tonnes of staple food are produced annually in SI (see Table 8.1).

Approximately 65% of this food is sweet potato, with cassava being the second most important at about 12%. This food production is equivalent in calories

Table A1.1.1 Indicative costs of Components 1a and 1b

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Support for DAL food crop agronomists, including field facilities, field experiments, travel and training	Field facilities \$150 000
	On-farm field experiment support \$25 000 per year for two years (\$50 000)
	Staff travel expenses \$25 000 per year for two years (\$50 000)
	Training \$10 000 per year for three years (\$30 000)
	Subtotal \$280 000 over three years
Multiplication of staple planting material at RTCs and other locations	\$50 000 per year for two years
	Subtotal \$100 000 over two years
Distribution of planting material	\$25 000 per year for two years
	Subtotal \$50 000 over two years
Collecting information from villagers on the performance of selected varieties	\$10 000 per year for three years
	Subtotal \$30 000 over three years
Two DAL agronomists	\$35 000 (including overheads) per agronomist per year for three years
	Subtotal \$315 000 over three years
Consultant horticulturalist	\$200 000 (including all travel and overheads) per year for two years
	Subtotal \$400 000 over two years
Short-term TA from food crop specialists in PNG	3 x 2 months @ \$25 000 (including all travel and overheads) per month
	Subtotal \$150 000 over two years
Total	\$1 325 000 over three years

DAL = Department of Agriculture and Livestock, RTC = rural training centre, TA = technical assistance, PNG = Papua New Guinea

to around 130 000 tonnes of rice. If there were a 1% increase in staple food production as a result of the introduction to the country of improved planting material, this would represent about a 4300-tonne increase in staple food production (the caloric equivalent of 1300 tonnes of rice).

The increase in staple food production can be valued according to the monetary value of its rice equivalent. In 2004, the average landed value of rice was \$3360/tonne, with an approximate wholesale value of \$4000/tonne (a marketing margin of 20%). Thus the value of a 1% increase in staple food production is around \$5.2 million (A\$1 million).

A 5% increase in staple food production represents a 21 600 tonne increase (6500 tonne rice equivalent) valued at \$26 million (A\$5.2 million).

1.1.5 COMPARING BENEFITS WITH COSTS

The introduction of improved planting material could be expected to produce at least a 1% increase in staple food production, and even a 5% increase seems a realistic expectation over 5–10 years. The

PNG experience shows that there has been, and continues to be, a high rate of replacement of older varieties by newer ones, which the villagers believe to be superior (Dr Mike Bourke, Department of Human Geography, The Australian National University, pers comm, November 2004). Villages judge superiority on a number of criteria, but one is yield. Bourke believes, based on numerous observations, that it is highly likely that the mean yield of sweet potato in PNG now is quite a bit higher than it would have been if villagers had retained their older varieties. This is also partly true for yam, taro etc, but it is much more applicable for sweet potato (and banana) than for the other root crops.

Table A1.1.2 assumes a 2% increase in staple food production achieved over a 10-year period. The benefits from this increase are compared with the costs. The increase in production is shown to occur in equal increments. The costs are shown to spread over three years, with the largest amount (\$750 000) spent in the first year. No costs are incurred after year three.

Table A1.1.2 Benefit costs from a 2% increase in staple food production achieved over a 10-year period through the implementation of Components 1a and 1b

YEAR	1	2	3	4	5	6	7	8	9	10
Increase in staple food production from 2004 level (tonnes)	860	1 720	2 580	3 440	4 300	5 160	6 020	6 880	7 740	8 600
Rice equivalent (tonnes)	258	516	774	1 032	1 290	1 548	1 806	2 064	2 322	2 580
Value of rice equivalent @ \$4,000/tonne (S\$)	1 032 103	2 064 206	3 096 310	4 128 413	5 160 516	6 192 619	7 224 722	8 256 826	9 288 929	10 321 032
Benefits (A\$)	206 421	412 841	619 262	825 683	1 032 103	1 238 524	1 444 944	1 651 365	1 857 786	2 064 206
Cost (A\$)	750 000	500 000	250 000							
B – C (A\$)	-543 579	-87 159	369 262	825 683	1 032 103	1 238 524	1 444 944	1 651 365	1 857 786	2 064 206
Total B – C over 10 years (A\$)	9 853 135									
NPV @ r(i) = 10% (A\$)	4 710 741									
NPV @ r(i) = 5% (A\$)	6 743 802									
IRR	74%									

NPV = net present value, IRR = internal rate of return, r(i) = rate of interest, B = benefits, C = costs

Table A1.1.3 Estimated economic rates of return from various staple food production increase scenarios resulting from the introduction of improved planting material

PRODUCTION INCREASE OVER 10 YEARS	TOTAL BENEFITS LESS COSTS OVER 10-YEAR PERIOD (A\$)	NPV @ R(I) = 5% (A\$)	IRR
1%	4.2 million	2.7 million	35%
2%	9.9 million	6.7 million	74%
4%	22.2 million	14.9 million	194%

NPV = net present value, r(i) = rate of interest, IRR = internal rate of return

It can be expected that the distribution of the new planting material will continue well beyond year three. It is assumed that this will be undertaken by the villages themselves, in the manner in which Melanesian villages have acquired improved planting material over the centuries.

These results give an indication of the great economic benefits from increasing food production. Over the 10 years, the benefits exceed the costs by almost \$10 million. If a 10% rate of discount is applied, the net present value (NPV) is \$4.7 million. If a 5% rate (probably a better approximation of a longer term social rate of discount) is applied, the NPV is \$6.7 million. The projections from the two components taken together yield an estimated internal economic rate of return (IRR) of 74% over the period.

The component that increases food production is seen to be highly economically viable. Even a modest response over an extended period generates a high rate of return. If there is only a 1% increase in staple food production over a 10-year period, the two proposed components remain economically viable. The NPV ($r(i)^{12} = 5\%$) is \$2.7 million and the IRR is 35% (see Table A1.1.3). If the production response is 4% over 10 years, exceptionally high economic rates of return are achieved. The NPV ($r(i) = 5\%$) is \$14.9 million and the IRR is 194%. Expectations of a 4% increase in staple food production over a 10-year period do not seem overly optimistic for a program that introduces proven higher yielding planting material.

It is difficult to envisage a development program that could generate a higher level of economic returns and spread the benefits more widely throughout the community.

1.2 COMPONENT 2: ENHANCED DOMESTICALLY MARKETED FOOD

1.2.1 COMPONENT OBJECTIVE

To increase the quantity and quality of fresh food being sold in Solomon Islands (SI), with a focus on Honiara and other urban markets.

To work with both female and male producers and sellers of food.

1.2.2 TYPE OF SUPPORT ENVISAGED

- > Provide support DAL horticulturalists, including field facilities, field experiments, travel and training.
- > Provide funds for the multiplication of planting material at RTCs and other locations, and the distribution of planting material.
- > Provide support for training selected villagers in production, handling and marketing of selected vegetables, fruits and edible nuts.
- > Physically upgrade selected markets (Auki, Noro, Taro, Seghe, Lata, Kirakira and Buala).
- > Produce booklets and other written material on producing and marketing selected vegetables, fruits and edible nuts.
- > Provide personnel, including two DAL horticulturalists and one expatriate horticulturalist, and some short-term TA from horticulturalist specialists.
- > Establish a TA project to set up a market information and dissemination system (see Volume 3, Appendix 3.8).

¹² r(i) = rate of interest

1.2.3 INDICATIVE COSTS

Table A1.2.1 Indicative costs of Component 2

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Support for DAL horticulturalist, including field facilities, field experiments, travel and training	Field facilities \$150 000
	On-farm field experiment support \$25 000 per year for two years
	Staff travel expenses \$25 000 per year for two years
	Training \$10 000 per year for three years
	Subtotal \$280 000 over three years
Multiplication of fruit and vegetable planting material at RTCs and other locations	\$50 000 per year for two years
	Subtotal \$100 000 over two years
Distribution of planting material	\$25 000 per year for two years
	Subtotal \$50 000 over two years
Physical upgrading of selected markets	Two markets per year for three years at \$100 000 per market
	Subtotal \$600 000 over three years
Manuals on the production and marketing of selected vegetables, fruits and edible nuts	Four manuals produced over three years at \$25 000 per manual
	Subtotal \$100 000
Two DAL horticulturalists	\$35 000 (including overheads) per agronomist per year for three years
	Subtotal \$315 000 over three years
Consultant horticulturalist	\$200 000 (including all travel and overheads) per year for two years
	Subtotal \$400 000 over two years
Short-term horticultural specialist	3 × 2 months @ \$50 000 (including all travel and overheads) per month
	Subtotal \$300 000 over two years
Road upgrading	\$2 million spent over three years — 50% of the cost attributed to this component
	Subtotal \$100 000
A TA project to set up market information and dissemination system	\$300 000 over 18 months
	Subtotal \$300 000
Total	\$3 445 000 over three years

DAL = Department of Agriculture and Livestock, RTC = rural training centre, TA = technical assistance

1.2.4 PROJECTED BENEFITS

A significant increase in the production and consumption of fresh food (particularly fruit, vegetables and nuts) is expected as a result of the implementation of this component. Farmers benefit from increased income; employment and income are generated along the marketing chain; consumers save money; and everybody benefits from improved health and nutrition. The nation saves foreign exchange and reduces expenditure on diseases such as diabetes.

Increased fresh food consumption arises from:

- > the introduction and distribution of new fruit and vegetables
- > improved quality of fruit and vegetables sold, through upgrading of municipal markets and better postharvest handling
- > increased fresh production and better seasonal distribution, through better market information and improved technology
- > increased marketing through providing road access.

An indication of the benefits accruing from component 2 can be gleaned by looking at a number of the specific elements of the component. These are:

- > the introduction and distribution of exotic fruit trees
- > the introduction and distribution of exotic vegetables
- > the encouragement of off-season pineapple production
- > the upgrading of market facilities
- > improvement of road access
- > the provision of basic market information.

Introduction and distribution of exotic fruit trees

The availability of good quality fruit at a reasonable price can be expected to generate its own demand. This can be seen from the experience of:

- > *Tomatoes in PNG.* PNG now enjoys a high degree of self-sufficiency in tomatoes, with around 1000 tonnes produced annually. A decade ago, virtually all tomatoes consumed in PNG were imported, with imports considerably less than the current local level of production (McGregor et al 2004).
- > *Hawaiian 'solo' papaya in Fiji.* Hawaii papaya was introduced to Fiji in the 1980s to develop an export industry. Exports have grown to around 300 tonnes annually, with shipment to New Zealand and Australia. However, double that amount of 'solo' papaya is sold on local markets. The farmgate value of these local sales is around Fiji dollar (FJD) \$2.5 million (A\$2 million).
- > *The Samoan Fruit Tree Development Project.* A range of exotic fruit (including rambutan, sweet carambola, avocado, durian, mangosteen and papaya) was introduced into Samoa by a United Nations Development Programme (UNDP) project, the main objective of which was to develop a fruit export industry. Particular success was achieved with the production of improved-variety rambutan. Rambutan was found to be a nonhost to Samoan fruit flies and a non-fruit fly host export protocol was negotiated with

New Zealand. However, to date no surplus fruit has been available for export. As rambutan has become more readily available, demand from local people has increased (UNDP/MAFFM 2002). A similar situation could be expected in SI for exotic fruits, such as avocado, sweet carambola, guava, durian, mango, langsung, lime, Malay apple, mangosteen, mandarin, orange, pomelo, pulasan, 'solo' papaya and rambutan.

If an additional 500 tonnes of these fruits were consumed annually, this would represent imputed farmgate value of around \$2 million at \$4/kg). If the Samoan experience is anything to go by, the response is likely to be considerably more.

Introduction and distribution of exotic vegetables

PNG's experience with English cabbage shows what is achievable with introduced vegetables. In PNG over the past couple of decades, English cabbage has moved from an exotic import to a staple vegetable consumed throughout the country. More than 10 000 tonnes are now produced annually, with imports now falling below 10 tonnes (McGregor et al 2004).

English cabbage was previously mainly a highlands crop. It is now widely distributed throughout the country because of the availability of suitable lowland varieties.

A comparable response might reasonably be expected in SI. Cabbages are a comparatively easy crop to grow, provided suitable varieties are readily available together with information on their production and marketing. The low value of the SI currency greatly favours the production of such crops.

A similar result might be expected for bulb onions. According to Ministry of Trade and Commerce statistics, SI imported 757 tonnes of onions in 2003. The actual market potential for onions is likely to be considerably more than the current imports, if they are readily available at a reasonable price. Most locally grown onions will likely be consumed by the communities that grow them.

The production of several thousand tonnes of onions is a realistic expectation. This would represent a \$3–4 million industry. While bulb

onions are a demanding crop in terms of production and postharvest handling requirements, they have been grown successfully in a range of PNG conditions (Wiles 2001).

Component 2 is about providing farmers with the required technology to produce and market this type of crop.

Encouragement of off-season pineapple production

Pineapples are cultivated throughout SI, but with a particular focus on Malaita. Virtually all this production is confined to a period between mid-November through to the end of January when the Honiara market is flooded with pineapples. During that season, pineapples are the main fruit on offer in the market and provide an important source of cash income for farmers. For the remainder of the year, virtually no pineapples are available.

Through the use of fruiting hormones and appropriate husbandry techniques, pineapples can readily be produced for 10 months of the year. Thus there is the potential to achieve a five-fold increase in the income derived from pineapples. The benefits from this increase would far exceed the cost of transferring this technology.

Upgrading of market facilities

The produce market is the commercial and social epicentre of any Pacific Island community. It is from here that most micro- and small enterprise activities originate. Investment in municipal market upgrading can provide a major stimulus to small-business development and generate substantial economic and social returns. However, most of Solomon Islands' municipal and open markets leave a lot to be desired. The Honiara market is an important exception.

Produce is often directly exposed to the harsh tropical elements, where it quickly deteriorates. As a consequence, the incomes of farmers and traders fall, produce is wasted and consumers buy inferior quality produce. A better quality produce sold in a more congenial environment will attract more consumers, thereby increasing demand for local produce and reducing demand for imported produce.

Without data on the volume of trade passing through the urban markets, it is difficult to quantify the actual benefits from investment in market upgrading in SI. However, based on experience elsewhere, the expected benefits are considerable. The following qualitative discussion points suggest the magnitude of possible benefits:

- > *Less wastage:* Produce exposed directly to the hot tropical sun deteriorates rapidly. The wastage can range from 10% to 50%, depending on the type of product and the prevailing demand at the time (Shepherd 1993). Sellers and buyers share these losses. Decent market facilities could be expected to reduce these losses by up to a half. A major municipal market like Auki might see 300 to 400 tonnes of produce brought to the market on a weekly basis. A smaller municipal market such as Noro would see about half that volume.
- > *Higher prices:* Better quality produce can expect to command price premiums over produce of deteriorating quality. Faced with shortened shelf life, vendors will lower prices to clear stocks quickly and reduce the time that produce is exposed to the elements.
- > *Increased supply:* Improved market facilities can be expected to induce a significant increase in the volume of produce on offer. This is the result of reduced risks and increased returns. Such a supply response was clearly evident for the Honiara market following its upgrading.
- > *Increased demand:* Greater availability of quality produce sold in a more congenial environment can be expected to increase the demand for produce sold in the market.

Provision of road access

The provision of road access, perhaps more than any other investment, is likely to give a high economic rate of return.

Roads are perhaps the most basic component of marketing infrastructure. A strategically placed road is often a sufficient condition for produce marketing to occur. In the case of Fiji, food supply has been able to expand to meet increases in demand from a rapidly growing urban population. The Asian Development Bank's *Agricultural Sector Review*

concluded that the government's investment in roads has been a major contributing factor to this process (ADB 1996). A significant share of the root crops found in the Suva market is a direct result of the EU-funded Waidina road built in the early 1980s. An ex-post economic evaluation of these roads revealed a far higher rate of return than had been envisaged in the original feasibility study.

A similar response could be expected to strategic road development in SI. The economic returns from road development on Malaita are likely to be particularly high, as the recent experience in north Malaita has shown. There, the main road was repaired under the Community Peace and Restoration Fund (CPRF) community roads program. The response in economic activity was immediate, particularly for copra and cocoa buying but also for trade in other produce.

Evaluating the benefits of Malaita road rehabilitation activity

Given that one-third of the rural population of SI lives on Malaita, road construction and maintenance would have a significant impact on marketing of copra, cocoa, fresh food, other crops and pigs. The benefits are not only in expanded trade but also in sustainable long-term land use and food security. There is high population pressure on land in north Malaita, and this is impacting adversely on food production. Population could be relieved by construction of roads to the centre of the island and the east coast, so that food and cash crop production could expand and relieve pressure on currently used land. A similar response might be expected from the rehabilitation of the Bursrata road to service central Malaita. Higher elevation areas in central Malaita would be well suited for the growing of brassica crops and other temperate vegetables for the Auki market and for shipment to Honiara.

The CPRF roads program on Malaita has successfully developed a system for community based road rehabilitation, and has proven to be efficient in making the best use of available resources. However, the overall impact of this program has been severely constrained by lack of basic plant — currently, the program has only one grader at its disposal. It is proposed that a basic

pool of second-hand machinery be supplied to this program to significantly build its capability. The estimated cost of this machinery is A\$800 000.

The road rehabilitation activity contributes to components 2, 3 (increased production of quality copra) and 4 (increased production of quality cocoa).

Only modest production response to this road rehabilitation investment is necessary to generate a high rate of economic return. Assume the following production increase:

- > An additional 500 tonnes of copra (about a 10% increase), increasing to 1500 tonnes over 3 years. The imputed free on board (fob) value of this additional copra is \$200/tonne.
- > An additional 100 tonnes of cocoa (about a 10% increase), increasing to 300 tonnes over 3 years. The imputed fob value of \$1500/tonne.
- > 50 tonnes of brassicas in year 2, increasing to 100 tonnes by year 3. The imputed Honiara market value for brassicas is A\$1/kg (SI\$5/kg).

The cost of the Malaita road rehabilitation component

The pool of equipment proposed is one grader, one loader, one roller, four tipper trucks and possibly one bulldozer. The estimated cost of good quality used equipment is around A\$800 000 (Ken Monroe, Ministry of Infrastructure, pers comm, November 2004). An equivalent allowance is made for the replacement of the equipment after five years, and an allowance of \$200 000 is made for annual operating costs.

Comparing benefits with costs

The resulting benefits and costs are presented in Table A1.2.2.

Table A1.2.2 Estimated economic returns for Malaita road rehabilitation component

YEAR	1	2	3	4	5	6	7	8	9	10
Benefit										
Increased copra production (tonnes)	500	1 000	1 500	1 500	1 500	1 500	1 500	1 500	1 500	1 500
Value of increased product (@ \$200/tonne fob)	100 000	200 000	300 000	300 000	300 000	300 000	300 000	300 000	300 000	300 000
Increased cocoa production (tonnes)	100	200	300	300	300	300	300	300	300	300
Value of increased product (@ \$1500/tonne fob)	150 000	300 000	450 000	450 000	450 000	450 000	450 000	450 000	450 000	450 000
Brassicas production (tonnes)	–	50	100	100	100	100	100	100	100	100
Value of production (@ \$1000/tonne Honiara)	–	50 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000	100 000
Total benefits (\$)	250 000	550 000	850 000	850 000	850 000	850 000	850 000	850 000	850 000	850 000
Cost										
Road rehabilitation equipment (\$)	800 000					800 000				
Operating costs (\$)	200 000	200 000	200 000	200 000	200 000	200 000	200 000	200 000	200 000	200 000
Total costs (\$)	1 000 000	200 000	200 000	200 000	200 000	1 000 000	200 000	200 000	200 000	200 000
Benefits – costs	–750 000	350 000	650 000	650 000	650 000	–150 000	650 000	650 000	650 000	650 000
Total B – C over 10 years	\$4 000 000									
NPV @ r(i) = 10%	\$2 021 728									
NPV @ r(i) = 5%	\$2 816 713									
IRR	64%									

fob = free on board, NPV = net present value, IRR = internal rate of return, B = benefits, C = costs

These figures show that the Malaita road rehabilitation component is highly economically viable. Based on modest increases in copra, cocoa and vegetable production, road rehabilitation generates an NPV ($r(i)=5\%$) of \$2.8 million over 10 years. The IRR is 64%.

The actual returns from the investment are likely to be considerably higher when the following considerations are taken into account:

- > A greater increase in copra and cocoa production might reasonably be expected.
- > Brassicas are used as a proxy for the increase in fresh food marketing. No allowance has been made for increased marketing of basic staples, which can be expected to increase significantly.
- > Conventional analysis of road projects concentrates on benefits, such as reduced travelling time and the reduced wear and tear on vehicles. No account of these benefits is made here.
- > There would be considerable benefits in the form of significantly improved access to basic services, particularly medical and educational services.
- > The road component is likely to have significant subsistence consumption and food security benefits. Considerable population pressure and declining land productivity are in areas such as North Malaita where there is road access. This pressure will be reduced by extending the road network in other arable areas.

1.3 COMPONENT 3: INCREASED PRODUCTION OF QUALITY COPRA

1.3.1 COMPONENT OBJECTIVE

To increase exports of quality copra from Solomon Islands (SI) and to get cash income into the hands of as many rural villagers as possible.

1.3.2 TYPE OF SUPPORT ENVISAGED

- > Provide components for constructing copra dryers in selected locations.
- > Provide financial support through once-off capital to selected copra buyers in remote locations.
- > Re-establish a small coconut seed garden network for distributing improved planting material for coconut replanting.

1.3.3 INDICATIVE COSTS

Table A1.3.1 Indicative costs of component 3

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Provision of steel pipe flues for copra driers in selected locations	700 flues @ \$1000 each over two years \$200 000 operating costs over two years Local coordinator \$25 000 (including overheads) per year for two years
	Subtotal \$950 000 over two years
Once-off injection of working capital to selected copra buyers in remote locations	\$400 000 in one year Local coordinator (same person as flue coordinator)
	Subtotal \$400 000
The re-establishment of a small hybrid coconut seed garden	Field facilities \$198 000 Operating costs \$100 000 DAL coconut agronomist \$40 000 (including overheads) per year for three years Consultant coconut agronomist \$100 000 (including all travel and overheads) per year for two years
	Subtotal \$618 000 over three years
Total	\$1 968 000 over three years

DAL = Department of Agriculture and Livestock

1.3.4 PROJECTED BENEFITS

The successful implementation of this component will result in an overall improvement in the volume and quality of copra production.

Table A1.3.2 simulates the impact of various copra production increases and price premiums due to quality improvements. The base level of production is 25 000 tonnes at an fob price of \$200/tonne. Three different scenarios modelled are:

- > Model 1: 5% increase in production over a 10-year period and a 5% price premium for improved quality starting from year 1.
- > Model 2: 5% increase in production over a 10-year period and a 15% price premium for improved quality starting from year 1.
- > Model 3: 15% increase in production over a 10-year period and a 15% price premium for improved quality starting from year 1.

1.3.5 COMPARING BENEFITS WITH COSTS

Table A1.3.3 compares the benefits with the costs for the three models.

Model 1 is not viable with a low production increase (5% over 10 years) and a small quality premium (5% overall price premium). If a reasonable price premium results from an improvement in quality, a high economic return is achieved. In model 2, there is a 15% overall price premium and a small increase in production over a 10-year period. This generates a \$4 million NPV ($r(i) = 5\%$) and an IRR of 48%. Given the high price discounts that poor quality copra incurs, a 15% overall price premium resulting from the widespread adoption of steel flues for drying would be a reasonable expectation. Good quality copra produced on steel flue driers can be used for virgin coconut oil production, thereby increasing the overall price premium obtainable. If overall copra production increases by 15% over a 10-year period, the rate of return increases significantly (NPV = \$6.1 million and IRR = 67%). A 15% increase in copra production over a 10-year period would seem a conservative estimate of the production response from a component that increases grower prices, provides working capital

Table A1.3.2 Benefits from various production and quality improvement responses from the implementation of Component 3

YEAR	1	2	3	4	5	6	7	8	9	10
Model 1: 5% increase in production over 10 years and a 5% price premium for improved quality										
Increased production	125	250	375	500	625	750	875	1 000	1 125	1 250
Value of increased production (@ \$200/tonne fob)	25 000	50 000	75 000	100 000	125 000	150 000	175 000	200 000	225 000	250 000
Total production	25 125	25 250	25 375	25 500	25 625	25 750	25 875	26 000	26 125	26 250
Quality improvement price premium 5% (\$10/tonne on total production)	251 250	252 500	253 750	255 000	256 250	257 500	258 750	260 000	261 250	262 500
Total benefit (\$)	276 250	302 500	328 750	355 000	381 250	407 500	433 750	460 000	486 250	512 500
Model 2: 5% increase in production over 10 years and a 15% price premium for improved quality										
Increased production	125	250	375	500	625	750	875	1 000	1 125	1 250
Value of increased production (@ \$200/tonne fob)	25 000	50 000	75 000	100 000	125 000	150 000	175 000	200 000	225 000	250 000
Total production	25 125	25 250	25 375	25 500	25 625	25 750	25 875	26 000	26 125	26 250
Quality improvement price premium 15% (\$30/tonne on total production)	753 750	757 500	761 250	765 000	768 750	772 500	776 250	780 000	783 750	787 500
Total benefit (\$)	778 750	807 500	836 250	865 000	893 750	922 500	951 250	980 000	1 008 750	1 037 500
Model 3: 15% increase in production over 10 years and a 15% price premium for improved quality										
Increased production	375	750	1 125	1 500	1 875	2 250	2 625	3 000	3 375	3 750
Value of increased production (@ \$200/tonne fob)	75 000	150 000	225 000	300 000	375 000	450 000	525 000	600 000	675 000	750 000
Total production	25 125	25 500	25 875	26 250	26 625	27 000	27 375	27 750	28 125	28 500
Quality improvement price premium 15% (\$30/tonne on total production)	753 750	765 000	776 250	787 500	798 750	810 000	821 250	832 500	843 750	855 000
Total benefit (\$)	828 750	915 000	1 001 250	1 087 500	1 173 750	1 260 000	1 346 250	1 432 500	1 518 750	1 605 000

fob = free on board

Table A1.3.3 Comparing benefits and cost of various production and quality improvement responses from the implementation of Component 3

YEAR	1	2	3	4	5	6	7	8	9	10
Model 1: 5% increase in production over 10 years and a 5% price premium for improved quality										
Total benefit (\$)	276 250	302 500	328 750	355 000	381 250	407 500	433 750	460 000	486 250	512 500
Costs										
Provision of steel flues	450 000	500 000								
Injection of working capital	400 000									
Hybrid coconut seed garden	620 000	620 000	620 000							
Total cost	1 468 000	1 118 000	618 000							
B – C	-1 191 750	-815 500	-289 250	355 000	381 250	407 500	433 750	460 000	486 250	512 500
Total B – C over 10 years	739 750									
NPV @ r(i) = 10%	-424 491									
NPV @ r(i) = 5%	17 990									
IRR	0.05									
Model 2: 5% increase in production over 10 years and a 15% price premium for improved quality										
Total benefit (\$)	778 750	807 500	836 250	865 000	893 750	922 500	951 250	980 000	1 008 750	1 037 500
Total cost (\$)	1 468 000	1 118 000	618 000							
B – C	-689 250	-310 500	218 250	865 000	893 750	922 500	951 250	980 000	1 008 750	1 037 500
Total B – C over 10 years	5 877 250									
NPV @ r(i) = 10%	2 720 383									
NPV @ r(i) = 5%	3 977 292									
IRR	48%									
Model 3: 15% increase in production over 10 years and a 15% price premium for improved quality										
Total benefit (\$)	828 750	915 000	1 001 250	1 087 500	1 173 750	1 260 000	1 346 250	1 432 500	1 518 750	1 605 000
Total costs (\$)										
B – C	-639 250	-203 000	383 250	1 087 500	1 173 750	1 260 000	1 346 250	1 432 500	1 518 750	1 605 000
Total B – C over 10 years	8 964 750									
NPV @ r(i) = 10%	4 343 863									
NPV @ r(i) = 5%	6 183 371									
IRR	67%									

B = benefits, C = costs, NPV = net present value, r(i) = rate of interest, IRR = internal rate of return

for remote locations and makes available improved coconut planting material. SI farmers have demonstrated an ongoing willingness to produce copra.

1.4 COMPONENT 4: INCREASED PRODUCTION OF QUALITY COCOA

1.4.1 COMPONENT OBJECTIVE

To increase the value of cocoa exports from SI by increasing production and improving quality.

1.4.2 TYPE OF SUPPORT ENVISAGED

> Include steel flues for cocoa dryers as part of the copra dryer improvement program.

- > Provide financial support for training cocoa growers in rehabilitation, production and processing.
- > Provide financial support for importing improved and black pod-resistant planting material (SG2 hybrids) from Papua New Guinea Cocoa and Coconut Institute; assistance to the private sector in the construction of nurseries; propagation of seedlings of improved material; distribution of seedlings to cocoa growers.
- > Provide personnel, including two DAL cocoa specialists and an expatriate cocoa specialist.
- > Provide short-term TA from PNG for cocoa intercropping demonstration.
- > Include cocoa in support provided for organic certification.

1.4.3 INDICATIVE COSTS

Table A1.4.1 Indicative costs of Component 4

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Steel flues for cocoa driers	100 flues @ \$1000 each over two years Rehabilitation of the Masara cocoa processing facilities \$15 000 Local coordinator also copra coordinator (included in copra component)
	Subtotal \$115 000
Financial support for training of cocoa growers	Travel and training materials \$50 000 per year for three years
	Subtotal \$150 000 over three years
Financial support for importation of improved and black pod-resistant planting material	Cost of imported material \$50 000 Seed garden facilities \$200 000 Operating cost \$100 000 Distribution costs \$50 000
	Subtotal \$400 000 over four years
DAL cocoa specialists and an expatriate cocoa specialist	Two DAL cocoa specialists @ \$35 000 (including overheads) each for three years (\$210 000) Consultant coconut agronomist \$100 000 (including all travel and overheads) per year for two years (\$200 000)
	Subtotal \$410 000
Short-term TA for cocoa intercropping demonstration	2 × 2 months @ \$25 000 (including all travel and overheads) per month
	Subtotal \$100 000 over two years
Inclusion of cocoa in support provided for organic certification	Total cost of organic agriculture support program \$250 000, of which 25% is attributed to cocoa
	Subtotal \$62 500 over two years
Total	\$1 237 500 over four years

DAL = Department of Agriculture and Livestock; TA = technical assistance

Table A1.4.2 The projected benefits from increasing the production of quality cocoa

YEAR	1	2	3	4	5	6	7	8	9	10
Benefits from improved production										
Production increase (tonnes)	50	120	240	360	480	600	720	840	960	1 080
Value of increased production @ \$1500/tonne fob	75 000	1 80 000	360 000	540 000	720 000	900 000	1 080 000	1 260 000	1 440 000	1 620 000
Benefits from improved quality										
Production base for quality improvement (tonnes)	5 050	5 170	5 290	5 410	5 530	5 650	5 770	5 890	6 010	6 130
Price improvement due to quality (\$)	10	50	75	75	75	75	75	75	75	75
Value of quality improvement (\$)	50 500	258 500	396 750	405 750	414 750	423 750	432 750	441 750	450 750	459 750
Total benefits (\$)	125 500	438 500	756 750	945 750	1 134 750	1 323 750	1 512 750	1 701 750	1 890 750	2 079 750

fob = free on board

Table A1.4.3 Comparing the cost and benefits from increasing the production of quality cocoa

YEAR	1	2	3	4	5	6	7	8	9	10
Total benefits (\$)	125 500	438 500	756 750	945 750	1 134 750	1 323 750	1 512 750	1 701 750	1 890 750	2 079 750
Costs (\$)										
Steel flues for cocoa driers	115 000									
Training	50 000	50 000	50 000							
Support for import black-pod resistant material	100 000	50 000	50 000	50 000						
TA for intercropping	50 000	50 000								
Support for organic certification	31 250	31 250								
Total costs	346 250	181 250	100 000	50 000						
B – C	-220 750	257 250	656 750	895 750	1 134 750	1 323 750	1 512 750	1 701 750	1 890 750	2 079 750
Total B – C over 10 years	\$11 232 500									
NPV @ r(i) = 10%	\$5 742 825									
NPV @ r(i) = 5%	\$7 926 740									
IRR	196%									

TA = technical assistance, B = benefits, C = costs, NPV = net present value, r(i) = rate of interest, IRR = internal rate of return

1.4.4 PROJECTED BENEFITS

The successful implementation of Component 4 will result in an overall improvement in the quantity and quality of cocoa. Observation and discussion with industry suggest that the overall cocoa production losses are in the order of 30% to 40%. At a current production level of 5000 tonnes, this represents an annual loss of 1500 to 2000 tonnes of cocoa annually.

A combination of improved cocoa husbandry and the widespread adoption of new black pod-resistant planting material from PNG could halve these losses over a 10-year period.

As with the copra component, the main benefits are to be achieved through improvements in quality. SI cocoa is often characterised by poor fermentation (underfermentation) and smoke contamination. Such cocoa can expect to receive a \$100 per tonne discount, depending on the prevailing price at the time.¹³ The distribution of steel flues and the processing training program address these cocoa quality issues. It is assumed that these activities can reduce the overall quality discount by half over a six-year period (an average of \$50/tonne). The introduction of organic certification will mean price premiums for participating farmers. Assuming that 25% of cocoa farmers obtain organic certification and that this cocoa reaps a \$100/tonne price premium, this would represent a \$25/tonne increase in the overall cocoa price. It takes three years to reach the \$75/tonne price premium.

The projected benefits from the cocoa component are summarised in Table A1.4.2.

1.4.5 COMPARING BENEFITS WITH COSTS

Table A1.4.3 compares the projected benefits with the costs of the cocoa component.

The projected economic viability of the cocoa component is high, with a net present value (NPV) of A\$7.9 million ($r(i) = 5\%$) and an internal economic rate of return (IRR) of nearly 200%. These results suggest that a program to improve the production of quality cocoa will provide a higher economic return than any other component.

1.5 COMPONENT 5: INCREASED PRODUCTION OF VIRGIN COCONUT OIL

1.5.1 COMPONENT OBJECTIVE

To increase the production of virgin coconut oil for domestic and export markets, with an emphasis on increasing the viability of existing operations.

1.5.2 TYPE OF SUPPORT ENVISAGED

- > Provide assistance in preparing advertising campaigns and promotion materials to increase the local consumption of edible oil.
- > Provide organisational and financial assistance in obtaining and maintaining organic certification (this would be combined with organic cocoa).
- > Provide assistance in the preparation and use of websites for niche export marketing.
- > Distribute steel flues for copra dryers in locations where cold-press copra mills have been established.
- > Provide assistance in the identification of export market buyers.
- > Construct a small jetty at Malu'u on north Malaita to facilitate the transportation of oil from the cold-press mill.

¹³ AgMark, PNG's largest cocoa exporter, occasionally buys SI cocoa for on-shipment to Singapore. AgMark reports around a US\$50/tonne quality-based discount applied to SI cocoa compared with PNG cocoa (John Nightingale, Managing Director, AgMark (PNG) Ltd, pers comm, October 2003).

1.5.3 INDICATIVE COSTS

Table A1.5.1 Indicative costs of Component 5

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Promotional material and advertising support	Promotional material \$50 000 Support for advertising \$50 000
	Subtotal \$100 000 over two years
Assistance with organic certification	Total cost of organic agriculture support program \$250 000, of which 50% is attributed to virgin coconut oil
	Subtotal \$125 000 over two years
Distribution of steel flues to support existing copra cold-press mills	Accounted for in Component 3
Website development	Subtotal \$50 000
Assistance in the identification of export market buyers	Consultancy \$20 000
	Subtotal \$20 000
Construction of small jetty at Malu'u, north Malaita	Subtotal \$50 000
Total	\$345 000 over two years

1.5.4 PROJECTED BENEFITS

The market and marketing situation report concluded that the production of virgin coconut oil offers considerable promise for significant industry value adding and diversification. The priority requirement for realising this potential is to increase the financial viability of existing operations. This involves increasing the price received by growers and reducing their cost of operation. If this can be achieved, a virgin oil industry equivalent to around 5% of current copra production is achievable (around 750 000 litres). High-quality virgin coconut oil should be able to command a fob/wholesale price of at least \$3/litre. This would represent a value added in excess of \$1 million annually.

1.5.5 COMPARING BENEFITS WITH COSTS

This component is directed at achieving a price level necessary for a substantial and viable industry. The cost of this component is \$345 000 spent over two years, with the expectation that this will result in the development of an industry with an annual value added exceeding \$1 million.

1.6 COMPONENT 6: VILLAGE-LEVEL FOOD PROCESSING FOR THE DOMESTIC MARKET

1.6.1 COMPONENT OBJECTIVE

To provide viable income-earning opportunities for isolated, economically marginal communities.

1.6.2 TYPE OF SUPPORT ENVISAGED

- > Provide ongoing technical support to the Kastom Gaden Association (KGA) in food processing initiatives.
- > Make technical food-processing advice available both to farmers and to private sector buyers and marketers. Advice on packaging has been identified as a priority need.
- > Produce simple pictorial food-processing manuals.
- > Provide marketing and business advice for small-scale processing operations, including facilitation of linkages between producers and marketers.
- > Provide training attachments to successful small-scale operations in other Pacific Island countries.

1.6.3 INDICATIVE COSTS

Table A1.6.1 Indicative costs of Component 6

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Ongoing technical support to KGA	Four months' international TA over three years \$200 000 Materials and equipment \$50 000
	Subtotal \$250 000 over three years
Technical food processing advice made available both to farmers and to private sector buyers and marketers	Two months' international TA over two years \$100 000 Materials and equipment \$50 000
	Subtotal \$150 000 over three years
Production of simple pictorial food-processing manuals	Two manuals at \$30 000 each
	Subtotal \$60 000
Provision of marketing and business advice for small-scale processing operations — including facilitating linkages between producers and marketers	Two months' international TA \$100 000 Three months' local TA \$45 000
	Subtotal \$145 000
Provision of training attachments to successful small-scale operations in other Pacific Island countries	Ten attachments at \$10 000 each, over two years
	Subtotal \$100 000
Total	\$705 000 over three years

KGA = Kastom Gaden Association, TA = technical assistance

1.6.4 PROJECTED BENEFITS

Specific outcomes of this initiative are difficult to predict. However, some targeted outcomes are:

- > cutnuts being processed and packaged on the Guadalcanal Weather Coast and sold in Honiara
- > banana and breadfruit chips being processed and packaged on the Weather Coast (and other locations) and sold in Honiara
- > villagers supplying a significant volume of roasted peanuts to Honiara and other centres
- > good quality, locally roasted coffee available in Honiara.

1.6.5 COMPARING BENEFITS WITH COSTS

The long-term income and distributional benefits from outcomes would well justify the estimated cost of this expenditure. The economic benefits can be measured in terms of value added. Some measure of the benefits required to achieve a positive economic rate of return from this expenditure is shown in Table A1.6.2, below. Here, the value added achieved in year 1 is \$40 000, and this increases by \$10 000 over a 10-year period. Under this scenario, the component would generate an IRR of 4%.

Table A1.6.2 Benefits required to achieve a positive rate of return for village-level food processing

	1	2	3	4	5	6	7	8	9	10
Benefits (value added) \$	40 000	50 000	60 000	70 000	80 000	90 000	100 000	110 000	120 000	120 000
Costs (\$)	235 000	235 000	235 000							
B – C	–195 000	–185 000	–175 000	70 000	80 000	90 000	100 000	110 000	120 000	120 000
IRR	4%									

B = benefits, C = costs, IRR = internal rate of return

1.7 COMPONENT 7: INCREASED PIG PRODUCTION FOR THE DOMESTIC MARKET

1.7.1 COMPONENT OBJECTIVES

To improve the productivity of pigs in subsistence and small-scale commercial systems throughout SI.

To improve participation of smallholder pig farmers in supplying commercial markets in the provincial capitals and Honiara.

To re-establish medium-scale pig production units on Guadalcanal and Malaita.

1.7.2 TYPE OF SUPPORT ENVISAGED

- > Engage the DAL national and provincial livestock extension officers, together with KGA or other nongovernment organisations (NGOs), to conduct benchmarking activities within local communities, provide technical information on husbandry and feeding systems, and conduct regular follow-up visits; introduce new ideas; facilitate articulation of subsistence production into commercial production where appropriate; and facilitate communication and understanding between suppliers and buyers.
- > Engage a mixture of local DAL staff and consultants to develop a range of appropriate extension and training materials.
- > Engage a mixture of local DAL staff and consultants (from Melanesia or with local experience) to provide training in business management specifically related to pig production.
- > Collaborate with the Australian Centre for International Agricultural Research (ACIAR) to develop commercial feeds from locally available feeds and byproducts, and imported supplements.
- > Build small-scale slaughterhouses as needed using standard plans, available through the Secretariat of the Pacific Community (SPC).
- > DAL and health inspectors to undertake annual audit of effluent management systems in peri-urban piggeries.
- > Negotiate support from SPC for an up-to-date animal disease survey and review of quarantine protocols.

1.7.3 INDICATIVE COSTS

Table A1.7.1 Indicative costs of component 7

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Support for livestock extension activities	Field and travel expenses \$50 000 a year for two years (\$100 000)
	Training \$10 000 per year for three years (\$30 000)
	Training materials (\$20 000)
	DAL livestock officer (\$35 000 per year including overheads) for two years (\$70 000)
	Subtotal \$220 000
Training in business management relating to pig production	International TA one month \$50 000
	Local TA two months \$30 000
	Subtotal \$80 000
Contribution to ACIAR feed project	Subtotal \$40 000
Upgrading the genetic stock of industry	Importing breeding stock \$100 000
	Materials and service \$50 000
	Subtotal \$150 000
Contribution to slaughterhouse construction	Materials \$50 000
	Services \$50 000
	Subtotal \$100 000
Total	\$590 000 over two years

DAL = Department of Agriculture and Livestock, TA = technical assistance

1.7.4 PROJECTED BENEFITS

SI is virtually self-sufficient in pig meat. The Livestock development report (Volume 2, Chapter 2) puts the value of this production in the order of \$120 million. There is huge scope to expand consumption by increasing availability and reducing prices. The weaning and subsequent growth rates of native pigs can be increased by 80% and 50%, respectively, through the adoption of improved feeding and management systems. Growth rates can be improved by up to 100% by introducing European breeds to produce crossbred pigs to replace native pigs. The cumulative benefits of the widespread adoption of these improvements would be considerable. The value added could be further increased through better use of locally available feed. The economic contribution of the proposed pig component is expected to be significantly more than the \$600 000 expended over two years.

1.8 COMPONENT 8: INCREASE POULTRY PRODUCTION FOR THE DOMESTIC MARKET

1.8.1 COMPONENT OBJECTIVES

To improve the productivity of subsistence poultry systems throughout SI.

To improve participation of smallholder poultry farmers in supplying commercial markets in the provincial capitals and Honiara.

To re-establish medium-scale poultry production units on Guadalcanal.

1.8.2 TYPE OF SUPPORT ENVISAGED

- > Engage DAL national and provincial livestock extension officers, together with KGA or other NGOs, to conduct benchmarking activities within local communities, provide technical information on husbandry and feeding systems, and conduct regular follow-up visits; introduce new ideas; facilitate articulation of subsistence production into commercial production where appropriate; and facilitate communication and understanding between suppliers and buyers.
- > Engage a mixture of local DAL staff and consultants to develop a range of appropriate

extension and training materials.

- > Engage a mixture of local DAL staff and consultants (from Melanesia or with local experience) to provide training in business management specifically related to poultry production.
- > Collaborate with ACIAR to develop commercial feeds from locally available feeds and byproducts, and imported supplements, and to evaluate dual-purpose production systems.
- > Negotiate support from the SPC for an up-to-date animal disease survey and review of quarantine protocols.

1.8.3 INDICATIVE COSTS

The component elements and cost estimates are approximately the same as for the pig component (\$600 000).

1.8.4 PROJECTED BENEFITS

The Livestock development report (Volume 2, Chapter 2) estimates the population of village poultry to be approximately 220 000 birds, with an imputed value of \$5 million. Simple husbandry and the expanded use of dual-purpose birds (meat and eggs) would greatly increase the value of production. Village chicken production could be dramatically increased by the introduction of pens to protect chickens from weather and predation, simple husbandry to reduce chick mortality, improved feeding systems and the introduction of dual-purpose birds.

Improved viability of commercial poultry production is dependent on the utilisation of higher quality local feeds at a lower cost than imported feeds.

There appears to be particularly high demand for eggs, reflected in the high level of egg imports (averaging 135 000 dozen eggs over the three-year period 2001 to 2003). With the restoration of greater normalcy to the economy, it is likely that these imports now exceed 150 000 dozen eggs. A shortage of eggs was noted in Honiara and the provincial centres.

1.9 COMPONENT 9: PRODUCTION AND SALE OF INDIGENOUS EDIBLE NUTS

1.9.1 COMPONENT OBJECTIVE

To facilitate the domestic and overseas marketing of indigenous edible nuts and nut products in SI.

1.9.2 TYPE OF SUPPORT ENVISAGED

- > Develop business skills and TA, and supply information to private enterprise buyers and nut processors, including the transfer of technology and expertise from Vanuatu and PNG.
- > Provide financial and information support for the Commodity and Export Marketing Authority

(CEMA) to promote and facilitate the supply of nuts to private buyers. In keeping with CEMA's new role, this will not involve the direct buying or selling of nuts.

- > Provide technical and capacity building assistance to regional (multipurpose) primary processing and storage units.
- > Provide TA for developing, testing and promoting on-farm processing and storage technologies.
- > Develop pilot microenterprise project for processing and packaging the substantial cutnut resource on the Guadalcanal Weather Coast.

1.9.3 INDICATIVE COSTS

Table A1.9.1 Indicative costs of Component 9

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Business and market information to private sector buyers and processors	Two months' international TA \$100 000
	Local coordinator \$30 000
	Attachment to Vanuatu and PNG nut enterprises \$20 000
Subtotal \$150 000 over two years	
Promotion and facilitation of supply of nuts to private buyers	Financial assistance to CEMA \$50 000
	Local coordinator covered above
	TA covered above
Subtotal \$50 000	
Assistance in regional primary processing and storage units	One month's international TA \$50 000
	Equipment and materials \$50 000
	Financial assistance \$50 000
Subtotal \$150 000	
Development, testing and promotion of on-farm processing and storage technologies	Two months' international TA \$100 000
	Equipment and materials \$100 000
	Subtotal \$200 000
Pilot microenterprise project for processing and packaging cutnuts from the Guadalcanal Weather Coast	Covered in component 6
Total	\$550 000 over three years

TA = technical assistance, PNG = Papua New Guinea, CEMA = Commodity and Export Marketing Authority

1.9.4 PROJECTED BENEFITS

Major development of the indigenous tree nut industry will require investment of a similar scale to that which has gone into the oil palm industry in recent decades. The end result could well be an industry of equivalent importance. Like oil palm, the nucleus enterprise model is highly appropriate for the development of a major indigenous nut industry. Until such investment is forthcoming, there are opportunities for much smaller scale development at the scale that has occurred in Vanuatu. A Vanuatu-scale commercial nut industry would be worthwhile in its own right and would well justify the proposed expenditure of approximately \$500 000. The demonstrated success of this component could provide the catalyst for the agribusiness investment required for a major industry. Should this occur, the longer term economic returns from the implementation of this component would be exceptionally large.

for the Soltai Fishing and Processing Ltd factory at Noro.

- > Train villagers in postharvest handling and drying of chillies.
- > Prepare a 'Pictorial Manual on the Growing, Post-Harvest Handling and Drying of Chillies in Solomon Islands'.
- > Support and assist Soltai, DAL, CEMA and growers to re-establish chilli supply chains by promoting chilli production and development of provincial grower groups.

1.10 COMPONENT 10: PRODUCTION OF SPICES FOR THE DOMESTIC AND EXPORT MARKETS

1.10.1 COMPONENT OBJECTIVES

To assist the development of vanilla as an export cash crop in agronomically suitable areas in SI.

To re-establish production and supply lines of chilli for use in the production of 'chilli tuna' by the Soltai cannery.

1.10.2 TYPE OF SUPPORT ENVISAGED

- > Provide support for restocking and propagating vanilla planting material in North Guadalcanal.
- > Train selected growers in production and processing techniques for vanilla in North Guadalcanal.
- > Facilitate the purchase and distribution of the recently published *Vanilla Agricultural and Curing Technique: A Photographic Handbook for Vanilla Farmers* (Bianchessi 2004).
- > Increase planting material for chilli production

1.10.3 INDICATIVE COSTS

Table A1.10.1 Indicative costs of Component 10

IDENTIFIED SUPPORT	ESTIMATED COST (A\$)
Propagation of vanilla planting material	Operating cost \$10 000
	Subtotal \$10 000
Training in vanilla production and processing techniques	1.5 months' international TA for workshops \$75 000 Expenses for 10 workshops @ \$5000 per workshop (\$50 000) Purchase and distribution of 200 manuals @ \$25 each (\$5000)
	Subtotal \$130 000
Multiplication of chilli planting material	Acquisition of seeds \$10 000 Materials \$10 000
	Subtotal \$20 000
Training villagers in the postharvest handling and drying of chillies	1/2 month international TA for workshops \$25 000 (same spice-processing consultant as vanilla) Four workshops @ \$5000 per workshop \$20 000
	Subtotal \$45 000
Production and distribution of chilli processing manual	One manual @ \$30 000
	Subtotal \$30 000
Support for chilli growing groups	Materials \$50 000
	Subtotal \$50 000
Total	\$285 000 over two years

TA = technical assistance

1.10.4 PROJECTED BENEFITS

Vanilla has high unit value, can be produced on a small area of land without land title, requires only labour inputs and, once cured correctly, is nonperishable. Even at the significantly lower prices that are projected, vanilla provides a relatively high return to effort. Thus, in locations where vanilla can be successfully grown (eg northern Guadalcanal), the crop has an important place in SI diversified agriculture. Farmers who have the knowledge to cure quality vanilla, and who use this knowledge and are rewarded accordingly, have a sustainable future in the industry even at relatively depressed prices.

It is a reasonable expectation that, as a result of the proposed intervention, SI could be exporting 2 tonnes of vanilla. At a low free on board (fob) price of \$100/kg, this would represent an industry of \$200 000. Such an industry would be an excellent return on an initial expenditure of less than \$150 000.

Volume 3, *Markets and Marketing Issues* identifies a currently available market for 10 tonnes of good quality dried chillies for the production of 'chilli tuna'. The price on offer to farmers is \$50/kg. A \$100 000 industry could be readily achievable within a period of a few years. Again, this would represent an excellent rate of return on an expenditure of around \$150 000.

1.11 A CONSOLIDATION OF ESTIMATED COSTS

The various categories of expenditure are shown in Table A1.11.1.

Table A1.11.2 presents a consolidation of the estimated costs of all 13 components. The total estimated cost of the components implemented over three years is \$15.1 million. This is broadly broken down as:

- > high-priority components (\$8.3 million)
- > medium-priority components (\$3.0 million)
- > low-priority components (\$1.3 million)
- > overhead and management costs 20% (\$2.5 million).

Table A1.11.1 Categories of expenditure for the 13 components

	A\$
Short-term international TA	1 800 000
Long-term international TA	1 830 000
Short-term local TA	200 000
Long-term local TA	1 138 000
Facilities	1 550 000
Roads/jetties	1 050 000
Materials and equipment	2 035 000
Operating costs	660 000
Travel/field expenses	375 000
Training	450 000
Manuals	220 000
NGO/grants	1 347 500
Total	12 655 500
Overheads and management costs (20%)	2 531 100
Grand total	15 186 600

TA = technical assistance, NGO = nongovernment organisation

Table A1.11.2 Consolidated costs of the strategy components

	SHORT-TERM INTERNATIONAL TA	LONG-TERM INTERNATIONAL TA	SHORT-TERM LOCAL TA	LONG-TERM LOCAL TA	FACILITIES	ROADS/ JETTIES	MATERIALS/ EQUIPMENT	OPERATING COSTS	TRAVEL/ FIELD EXPENSES	TRAINING	MANUALS	NGOS/ GRANTS	TOTAL
High-priority components													
Component 1a (quarantine needs)	50 000		15 000		300 000		50 000						415 000
Component 1b (food security)	150 000	400 000		315 000	150 000		50 000		50 000	30 000		180 000	1 325 000
Component 2 (domestically marketed food)	300 000	700 000		315 000	750 000	1 000 000	50 000		50 000	30 000	100 000	150 000	3 445 000
Component 3 (copra)		200 000		50 000	200 000		700 000	300 000				400 000	1 850 000
Component 4 (cocoa)	100 000	200 000		210 000	150 000		165 000	100 000	75 000	75 000		162 500	1 237 500
Subtotal	600 000	1 500 000	15 000	890 000	1 550 000	1 000 000	1 015 000	400 000	175 000	135 000	100 000	892 500	8 272 500
Medium-priority components													
Component 5 (virgin coconut oil)			20 000			50 000						275 000	345 000
Component 6 (village food processing)	400 000		45 000				100 000			100 000	60 000		705 000
Component 7 (pigs)	50 000	30 000		70 000			200 000	50 000	100 000	50 000		40 000	590 000
Component 8 (poultry)	50 000	30 000		70 000			200 000	50 000	100 000	50 000		40 000	590 000
Component 9 (nuts)	250 000		30 000				150 000			20 000		100 000	550 000
Component 10 (spices)	100 000						70 000	10 000		70 000	35 000		285 000
Subtotal	850 000	60 000	95 000	140 000		50 000	720 000	110 000	200 000	290 000	95 000	455 000	3 065 000
Low-priority components													
Component 11 (beef)	100 000		75 000	54 000			100 000						329 000
Component 12 (honey)		270 000	15 000	54 000			100 000	50 000		25 000	25 000		539 000
Component 13 (nontimber forest products)	250 000						100 000	100 000					450 000
Subtotal	350 000	270 000	90 000	108 000			300 000	150 000		25 000	25 000		1 318 000
Total	1 800 000	1 830 000	200 000	1 138 000	1 550 000	1 050 000	2 035 000	660 000	375 000	450 000	220 000	1 347 500	12 655 500
High-priority components													
Medium-priority components	3 065 000												
Low-priority components	1 318 000												
Total	12 655 500												
Overheads and management cost (20%)	2 531 100												
Grand total	15 186 600												

TA = technical assistance, NGO = nongovernment organisation

Appendix 1.2 Study team

THE SERIES IS BASED ON STUDIES IN SOLOMON ISLANDS FROM SEPTEMBER TO NOVEMBER 2004. THE 13-PERSON STUDY TEAM CONSISTED OF: MATTHEW ALLEN, MIKE BOURKE (CO-LEADER), BARRY EVANS, ELLEN IRAMU, ROSELYN KABU MAEMOURI, ANDREW MCGREGOR, BEN MULLEN, ALICE ARUHEETA POLLARD, MORGAN WAIRIU, CLAUDINE WATOTO AND STAV ZOTALIS (CO-LEADER).

Mr Matthew Allen

Mr Matthew Allen is a human geographer specialising in rural development in Melanesia. He holds a research Masters Degree in geography, based on eight months field work on a small island in Vanuatu in 1997. From 1999 to 2001, he worked as a long-term consultant on an AusAID-funded agricultural research and development project in Papua New Guinea (PNG). Matthew is currently undertaking doctoral research at the Australian National University, focusing on land, resources, internal migration and conflict in Solomon Islands. He also continues to work part-time for the Land Management Group at ANU, where he is writing sections of a book about the agricultural economy of PNG.

Dr Mike Bourke

Dr Mike Bourke has qualifications in agricultural science from the University of Queensland and the University of Papua New Guinea, and a PhD in human geography from the Australian National University (ANU). He has been engaged in development and research in the Pacific for the past 35 years. Since working for the PNG Department of Agriculture as a research agronomist from 1970 to 1983, Mike has been based at the ANU. He is a specialist in Pacific village agricultural systems and food crops. His published works include *Production Patterns of 180 Economic Crops in Papua New Guinea* and over 200 papers, mostly on PNG agriculture. Mike is working on new publications on sweet

potatoes in Oceania and food security in PNG, where he is also involved in development work with World Vision and with the AusAID-funded Agricultural Innovations Grant Facility.

Mr Barry Evans

Mr Barry Evans has a BA in Development Studies (Natural Resource Management) from the University of East Anglia and a Masters in Agriculture (Tropical Agriculture) from the University of Sydney. From 1988 to 1991, he was Senior Agricultural Research Officer and Technical Cooperation Officer for the United Kingdom Overseas Development Administration. Barry's work included designing and managing a project to develop indigenous edible-nut trees as smallholder-based cash crops, and involved research into botany, agronomy, processing and marketing. As tree crop agronomist and Senior Forest Conservation Officer for the World Wide Fund for Nature South Pacific Program, he was based in Fiji from 1994 to 1997. He made many trips to Solomon Islands, providing technical backstopping for WWF projects.

Ms Ellen Iramu

Ms Ellen Iramu MPhil graduated from the University of the South Pacific School of Agriculture in 1993. She worked mostly with root and spice crops before undertaking a postgraduate study in taro breeding at the PNG University of Technology from 1999 to 2002. Ellen has worked for 10 years with the Research Division of the Department of

Agriculture and Livestock in Solomon Islands, where she is currently Senior Research Officer. She is also the national coordinator of the Development of Sustainable Agriculture in the Pacific project, which addresses the food security of farming communities. Together with project colleagues, Ellen has been conducting workshops with farmers to identify areas of work for the project.

Mr Tony Jansen

Mr Tony Jansen BA has ten years of experience in remote-area agriculture extension and project management in Solomon Islands and, more recently, in PNG and Vanuatu. He founded the nongovernment organisation (NGO) Kastom Gaden Association, which has developed innovative approaches to solving farmers' problems in Solomon Islands, including farmer-to-farmer extension, farmer networks, participatory technology development with farmers, development of farmer-based systems for enhancing on-farm conservation of agriculture plant genetic resources, practical and effective training and support models, and culturally appropriate and sustainable extension systems. He was Program Director of the two-year Sustainable Livelihoods for Rural Youth Project that developed the improved local poultry, piggery and agroforestry training program in Solomon Islands. More recently, he has been working with the Australian Centre for International Agricultural Research (ACIAR) on on-farm research into household-produced feeds for village poultry in Solomon Islands. He is also a part-time coordinator of the Melanesian Farmer First Network, an organisation that aims to link and build capacity of NGOs with a proven track record in agriculture, community health and food security in PNG, Solomon Islands and Vanuatu.

Ms Roselyn Kabu Maemouri

Ms Roselyn Kabu Maemouri is a trained community development worker with experience on a range of projects with women farmers. She has undertaken training in nutrition at the University of the South Pacific, Solomon Islands, and in leadership and social change in the Philippines with the International Institution for Rural Reconstruction. As Program Manager for the Kastom Gaden

Association, Roselyn currently manages the AusAID-funded Sustainable Livelihoods for Rural Youth Project and the EU-funded Strengthening Farmer Networks for Food Security Project. She ensures that sound and appropriate participatory techniques are used in all aspects of the project cycle in KGA. Roselyn's work for the association has included projects on integrated pest management, bush foods, seed distribution and planting materials networks.

Dr Andrew McGregor

Dr Andrew McGregor holds a PhD from Cornell University. He is an agricultural economist specialising in the Pacific islands. Over the past 30 years, Andrew has worked in most Pacific island countries, and also in the eastern Caribbean and Hawaii. He is now based in Fiji, where he manages the Trade and Development Office.

Dr Ben Mullen

Dr Ben Mullen is a livestock farming systems specialist focusing on sustainable forage-based production in the tropics. His experience in Melanesia began with work on a highly successful AusAID-funded development project in Vanuatu. Over the past 20 years, Ben has worked on research and development throughout Southeast Asia, the Western Pacific and northern Australia. Based at the University of Queensland for the past 12 years, his primary research interest has been systems involving coconuts, rubber, oil palm, timber and forage tree legumes. Ben has conducted farmer-oriented extension programs in Vanuatu, PNG, Vietnam, Indonesia, the Philippines and northern Australia, focusing on the integration of locally available feed sources from multipurpose forage trees and byproducts for ruminant production.

Ms Alice Aruheeta Pollard

Ms Alice Aruheeta Pollard has a Diploma in Education from the University of the South Pacific, and a BA in Community Development and Masters in Women's Studies from the Victoria University of Technology, Melbourne. She is currently doing her doctorate at Victoria University, Wellington,

researching gender and leadership in Solomon Islands. After working as a secondary school teacher in Malaita Province, Alice joined the Solomon Islands Government's Women and Development Division, where she served for 14 years. Since 1999, she has been involved with community and women's development work, and was instrumental in the Women for Peace movement at the height of the civil conflict.

Dr Morgan Wairiu

Dr Morgan Wairiu has a PhD in Environmental Soil Science from Ohio State University, an MSc in Forest Soils from Aberdeen University (Scotland), a postgraduate Certificate in Agriculture Development from Wye College, University of London, and a Bachelor of Tropical Agriculture from the University of PNG. He currently holds a volunteer position as Executive Director of Environmental Concerns Action Network of Solomon Islands (ECANSI), and coordinates projects in forest advocacy, good governance and resource management in selected communities. Morgan has 17 years experience in project management and planning, research and statistical analysis, and development of policy and strategic action plans. He has held executive and management positions in various Solomon Islands government, nongovernment and commercial organisations.

Ms Claudine Watoto

Ms Claudine Watoto has undertaken courses in NGO management with Unitech Auckland, Victoria University, APACE (Appropriate Technology for Community and Environment) and the University of Technology Sydney, and in distance education training at the Solomon Island College of Higher Education. She has been working in rural electrification programs with rural communities in Solomon Islands for six years, and since 2001 has been AusAID's Program Officer responsible for regional and bilateral NGO and community-sector programs. Claudine is experienced in program coordination at the national, provincial and rural levels, including managing, designing and implementing rural micro-hydro projects.

Ms Stav Zotalis

Ms Stav Zotalis holds an MA in International Relations and a Bachelor of Commerce from the University of New South Wales, and was the Regional Assistance Mission to Solomon Islands (RAMSI) Rural Livelihoods Adviser in Solomon Islands in 2004. Her previous experience includes eight years as a microfinance/microenterprise specialist and development program manager, and five years in private sector management. Stav is experienced in the design, management, appraisal and monitoring of projects and programs in microfinance, microenterprise development, rural livelihoods and community development. Her experience includes work in Bangladesh, Cambodia, East Timor, Fiji, India, Nepal, Pakistan, the Philippines, Samoa, Solomon Islands, Sri Lanka, Vanuatu, Vietnam and Australia.

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