THE GOVERNMENT OF MALAYSIA
THE STATE OF SARAWAK

MIRI-BINTULU

REGIONAL PLANNING STUDY

SUPPORTING REPORT

No. 2

AGRICULTURE
PART II
THE AGRICULTURAL PLAN

—1974—

HUNTING TECHNICAL
SERVICES LTD. LONDON

HOFF AND OVERGAARD
COPENHAGEN

THE GOVERNMENTS OF MALAYSIA AND THE
STATE OF SARAWAK

MIRI BINTULU REGIONAL PLANNING STUDY

SUPPORTING REPORT
No. 2

AGRICULTURE

PART II
THE AGRICULTURAL PLAN

— 1974 —

HUNTING TECHNICAL
SERVICES LTD. LONDON

HOFF AND OVERGAARD
COPENHAGEN

C O N T E N T S

FIGURES

APPENDICES

TABLES

CONVERSIONS

Linear Measures:

1 inch	=	25.4 millimetres
	=	2.54 centimetres
1 foot (12 inches)	=	0.3048 metre
1 yard (3 feet)	=	0.9144 metre
1 chain (22 yards)	=	20.117 metres
1 mile (1 760 yards)	=	1.609 kilometres

Square Measures:

1 square inch	=	6.45 square centimetres
1 square foot	=	9.29 square decimetres
1 square yard	=	0.836 square metre
1 acre (4 840 sq. yards)	=	0.405 hectare
1 square mile (640 acres)	=	259.00 hectares

Weights:

1 ounce (16 drams)	=	28.350 grammes
1 pound (16 ounces)	=	0.454 kilogram
	=	12 tahils
1 tahil	=	1.33 ounces
1 kati (16 tahils)	=	1.33 pounds
1 kilogram	=	1.65 katis
1 cwt (112 pounds)		50.8 kilograms
1 ton (20 cwt)	=	16.8 piculs
1 picul	=	100 katis

Measure of Capacity:

1 pint	=	0.568 litre
1 quart (2 pints)	=	1.137 litres
1 gallon (4 quarts) (or 1 gantang)	=	4.546 litres

CHAPTER 1

INTRODUCTION

The factors affecting the planning of agricultural development, as well as the principles and strategies recommended for adoption in planning, are described and discussed in Part I of this Supporting Report. In Part II the application of these ideas and the proposals resulting from them to the Study Area is described.

The land and soil survey investigations, together with existing development and natural geographical features have led to the division of the Study Area into nine parts as shown in Figure 1.1. These divisions have been called Rural Development Areas (RDA) and have been individually named as follows:-

Miri	Sekudong
Marudi	Labang-Tubau
Lambir-Subis	Nyalau
Long Lama	Bintulu
Niah-Suai	

Basically each RDA is a composite geographical area, the size and location of which is determined by physical, organisational, management, processing and investment factors. Each Area consists of land that can be largely developed independently as a viable investment package based on agriculture and forestry, but development in one Area would generally be mutually supporting with previous or subsequent development in an adjacent Area.

It is proposed that development should start as soon as possible in those parts where cultivation already exists, thus ensuring that the local people become part of the overall development. The activities in each RDA are planned to follow the principle of concentrating development effort to create a nucleus on which further development can be based and from which it can spread. In four Areas the nuclei already exist. These are the towns of Miri, Bintulu and Marudi in their respective RDAs, and in the Lambir-Subis RDA the oil palm estates of the Sarawak Oil Palms (SOP) and the Sarawak Land Development Board (SLDB). The SOP is the name given to a local venture between the Commonwealth Development Corporation and Sarawak Government. In the land around these nuclei expansion of development only has to be planned, but in the other RDAs the nuclei have to be created.

In all cases it is intended to combine and integrate forest harvesting and agricultural development with all the other activities necessary to create a modern society; improved transport and communication facilities, urbanisation, the establishment of industries and provision of services such as education, medical and administration. The agricultural deve-

lopment has been planned to be carried out largely by the SLDB and Department of Agriculture, but also by private organisations and individuals. The organisation and management of SLDB is described in Part III while here only a summary of estimates of management and administrative staff are given. In the land tenure agreements drawn up for private development, clauses should be included to ensure rapid development of the land. Suggestions are that for small and medium sized farms, say up to 500 acres each, three years should be the maximum time allowed for clearing and planting the land. For larger acreages four years would appear reasonable. Creation of the supporting infrastructure should be undertaken by the appropriate Government Departments and institutions. The combining of all these various inputs into an integrated development plan is described in Supporting Report Number 5. A vital contribution by the Department of Agriculture would be the creation of the Agricultural Development Unit (ADU), which is a proposed organisation of specially trained staff formed into teams specifically to guide and support the small-holder farmers associated with SLDB schemes and road-based improvements. The formation, training and operation of the ADU are fully explained in Part III.

Basically the ADU is envisaged as an integral part of the Department of Agriculture formed under the Farmers Organisation Section. It would operate only within the intensive development areas. The specially trained staff would be organised into teams which would be stationed at convenient localities, thus forming ADU Centres, as close as possible to the farmers they serve.

Each ADU Centre would consist of offices and stores and the staff would be from four sections each covering different aspects of the work, as follows:-

(a) agricultural extension, including home economics and, where appropriate, advice on silvicultural operations in communal forests;

(b) agricultural economics, concerned with the supply of farming requirements, marketing of produce and farm mechanisation;

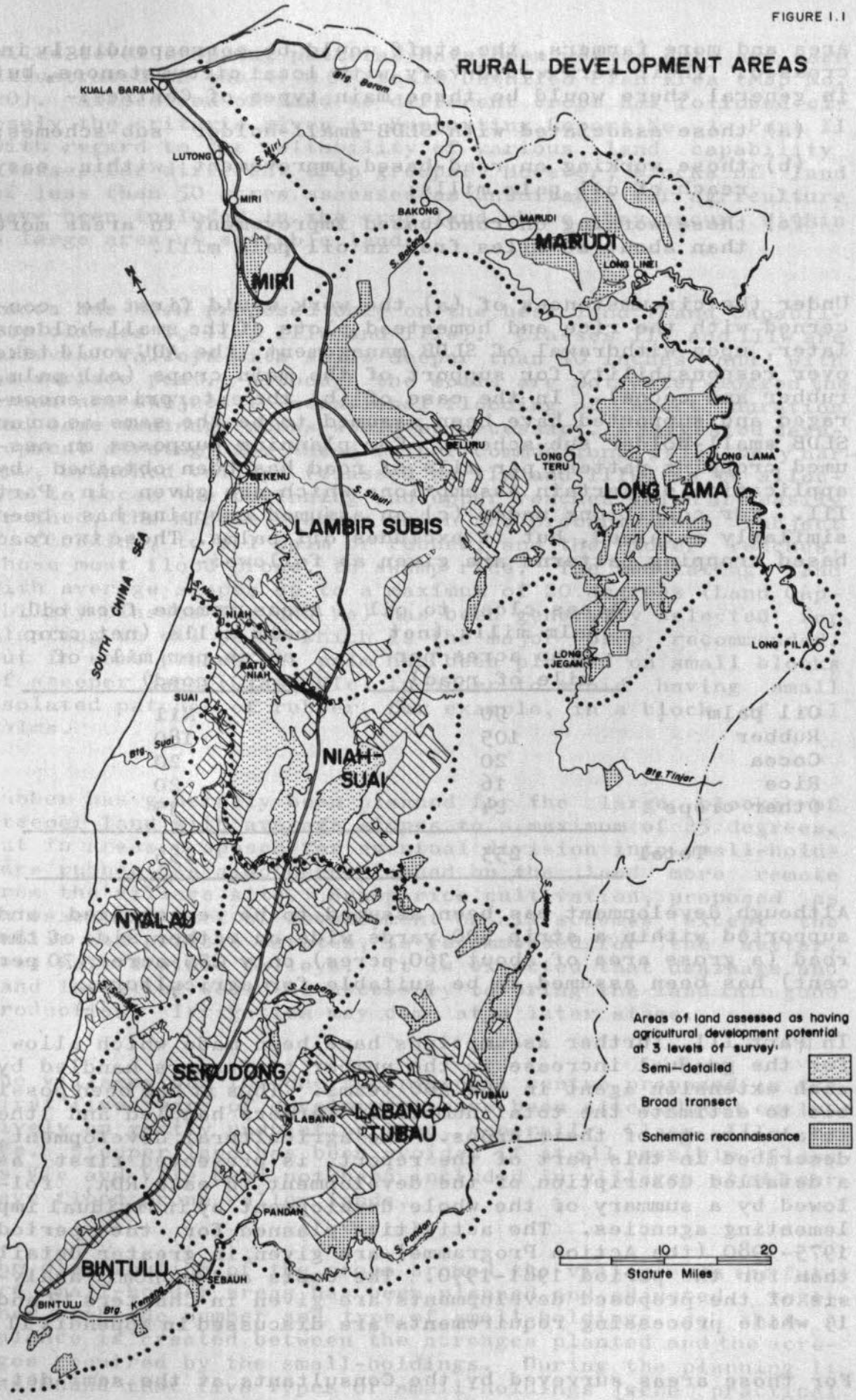
(c) credit and savings, handling cash and credit payments to farmers and providing savings facilities;

(d) accounts, concerned with keeping records of all transactions with every participant farmer.

This arrangement is a replica of the administrative system established in the farmers' organisations already formed in other parts of Sarawak. Thus the emergence of farmers' organisations from the work of the ADU Centres is expected to be a natural and easy process.

At first the number of staff at each Centre would be the minimum required to start and undertake a limited amount of work, but gradually, as the activities expanded covering a greater

FIGURE I.1


RURAL DEVELOPMENT AREAS
KUALA BARAM
Btg. Berom
LUTONG
S. Miri
MIRI
BAKONG
MARUDI
S. Baka
MARUDI
LONG LINEI
MIRI
BELURU
LONG TERU
LONG LAMA
LONG LAMA
BEKENU
S. Sibuti
LAMBIR SUBIS
SOUTH CHINA SEA
NIAH
LONG PILA
BATU NIAH
LONG JEGAN
SUAI
Btg. Suai
NIAH-SUAI
Btg. Tinjar
NYALAU
S. Lebong
SEMUDONG
TUBAU
LABANG
LABANG-TUBAU
PANDAN
S. Pandan
BINTULU
SEBAUH
BINTULU
Btg. Kemena
Areas of land assessed as having agricultural development potential at 3 levels of survey
Semi-detailed
Broad transect
Schematic reconnaissance
0
10
20
Statute Miles

area and more farmers, the staff would be correspondingly increased. Their work would vary with local circumstances, but in general there would be three main types of Centres:-

(a) those associated with SLDB small-holder sub-schemes;

(b) those working on road-based improvement within easy reach of oil palm mills;

(c) those working on road-based improvement in areas more than about 20 miles from an oil palm mill.

Under the circumstances of (a) the work would first be concerned with the rice and homestead plots of the small-holders; later, upon withdrawal of SLDB management, the ADU would take over responsibility for support of the main crops (oil palm, rubber and cocoa). In the case of (b) the enterprises encouraged and supported have been assumed to be the same as on an SLDB small-holder sub-scheme. For planning purposes an assumed cropping pattern per mile of road has been obtained by application of certain assumptions which are given in Part III. For conditions under (c) an assumed cropping has been similarly obtained, but it excludes oil palms. These two road-based cropping patterns are given as follows:-

	Areas close to oil palm mills (net crop acres per mile of road)	Areas remote from oil palm mills (net crop acres per mile of road)
Oil palm	90	Nil
Rubber	105	180
Cocoa	20	20
Rice	16	20
Other crops	24	35
Total	255	255

Although development has been assumed to be encouraged and supported within a strip 500 yards wide on either side of the road (a gross area of about 360 acres) only 255 acres (70 per cent) has been assumed to be suitable for agriculture.

In Part III, further assumptions have been made which allow for the gradual increase in the number of farmers handled by each extension agent in the ADU teams. Thus it has been possible to estimate the total number of farmers handled and the total acreage of their crops. The agricultural development, described in this part of the report, is presented first as a detailed description of the development in each RDA, followed by a summary of the whole development by individual implementing agencies. The activities planned for the period 1975-1980 (the Action Programme) are given in greater detail than for the period 1981-1990. The costs and economic analysis of the proposed developments are given in Chapters 12 and 13 while processing requirements are discussed in Appendix II.

For those areas surveyed by the Consultants at the semi-det-

ailed level cropping patterns have been worked out and are illustrated on the 1:50 000 scale Detailed Plan Area (Map No. 20). Allocation of land to different crops has followed closely the criteria given in Supporting Report No. 1 Part II with regard to the suitability of various land capability classes for different crop groups. However, blocks of land of less than 50 acres assessed as unsuitable for agriculture have been included in the crop land where they occur within a large area of suitable land.

Cocoa has been proposed only on the best land (Land Capability classes I, IIw, IIIw and IIIe). Classes IIw and IIIw are alluvial valleys with soils deeper than 40 inches and with no surface peat. Although the soils are not water-logged the areas are subject to occasional flooding of short duration and some drainage works would be necessary. A suggested development strategy for these rather common long, relatively narrow, branched valleys (classed as IIw and IIIw) is to allocate to cocoa the beginning and upper reaches which are easily drained, the middle reaches which are probably more subject to flooding, to oil palm or rubber, and the lower reaches, those most flood prone, to swamp rice. The undulating land with average slopes up to a maximum of 20 degrees (Land Capability Classes IVe and Ve) has been generally selected for planting to oil palms which is the major crop recommended. But in some places oil palm has been planned on small blocks of steeper land (Class VIe) in order to avoid having small isolated patches of rubber, for example, in a block of oil palms.

Rubber has generally been planned for the large blocks of steeper land with average slopes to a maximum of 25 degrees. But in areas proposed for eventual division into small-holdings rubber has also been planned on the land more remote from the village site. Swamp rice cultivation, proposed as an essential part of development on all schemes except the public and private estates, is recommended for the wetter, less well drained valleys. It is expected that drainage and land levelling would be necessary to bring the land into good production. Irrigation may come at a later stage.

The villages and the one sub-regional centre proposed in the first five years of development have been sited almost exclusively on gently undulating land, generally Class IIIe or IVe. Steeper land has been avoided if at all possible. Classes VIe and VIIe have not been included in villages at all nor have flood prone valley lands.

The distribution of the crops around the villages in the future small-holder areas has been planned and adjusted, together with the number and type of small-holdings, so that a balance is created between the acreages planted and the acreages required by the small-holdings. During the planning it was found that five types of small-holdings were practical and necessary. These are given in Table 1.1.

TABLE 1.1 TYPES OF SMALL-HOLDINGS USED IN THE AGRICULTURAL PLANNING

Type of small-holding	Crops (net acres)					
	Oil palm	Rubber	Cocoa	Rice*	Homestead	Total
a	9	6	-	1	1	17
b	10	5	-	1	1	17
c	11	4	-	1	1	17
d	10	-	4	1	1	16
e	9	-	5	1	1	16

Note * In some of the small-holder schemes the average plot of rice would be slightly less than one acre.

The assumed yields and inputs of crops are given in Part IV and these are considered applicable to all cases except road-based improvement schemes, where reductions of 10 per cent for both inputs and yield are considered appropriate because the farmers would be more dispersed, and there would not be the same degree of contact and control with them as, for example, in the case of small-holders on schemes initiated by SLDB.

In the areas where detailed planning has been done, land shown on the 1:250 000 scale Land Use Maps, Series No. 22 as occupied has been assumed to be legally occupied, while land opened up for shifting cultivation since then, as shown on 1972 aerial photographs, has been taken as illegally occupied. Such land has therefore been assumed available for public development and has been included in the detailed planning. It is recommended that determining and demarcating the boundaries of the legally occupied land in these areas is given the highest priority. Suggested principles for undertaking this politically and socially difficult task are given in Part I. The boundaries must be established before orderly development can take place. Therefore the Administrative Officers, staff of the Land and Survey Department and Forest Department in the Fourth Division should be given specific instructions concerning this.

A similar position exists concerning future semi-detailed soil surveys. These would be necessary not only to determine the land capability classes for detailed agricultural planning, but also necessary for organised forest harvesting. If the principle of removing all marketable timber from lands destined for agriculture before clearing starts is to be adhered to, then semi-detailed soil surveys must be carried out well in advance of the commencement of logging activities. This is of equal importance in areas where salvage logging operations would be carried out and in areas of primary exploitation of virgin forest. The loggers would need to know the boundaries between land destined for allocation to agricul-

ture and land destined to remain under permanent forest because the levels and techniques of logging are different in each case. On land remaining in permanent forest the harvesting would be strictly controlled; only trees of a certain minimum girth would be allowed to be felled, and special care in felling and road making would be necessary to minimise damage to saplings and the remaining trees. Besides careful felling techniques and alignment of roads, culverts would be needed in all roads to ensure drainage lines would be kept open to prevent ponding and drowning of trees. These controls and precautions would not be necessary on future agricultural land. Determining the exact location of the boundaries between these land categories will require semi-detailed soil surveys, and a schedule for these surveys is included in Chapter 11.

CHAPTER 2

THE MIRI RDA

2.1 THE PRESENT SITUATION

General

The activities associated with the exploitation of oil and natural gas occurring in the vicinity of Miri on land and off-shore has been the reason for the present relatively advanced development of Miri town and the land immediately around it. Many of the people living in the Area are connected in some way with the oil industry. However, Miri town is mainly a commercial bazaar, but it is also a Government Divisional administrative headquarters. The SLDB are constructing an oil palm storage terminal on the bank of the Miri River north of the town. All the forest in the Area has been exploited. About 17 200 acres of steep, rugged, forested terrain, which includes the Lambir hills, has been proposed as a National Park while a smaller area covering about 1 300 acres of logged kerangas forest close to the airport has also been proposed for reservation. A conservation park is recommended along the cliff tops at Tanjong Lobang (see Supporting Report No. 3 Part II).

Approximate Population (1970)

Urban (Miri, Lutong) - 27 000;
Rural and semi-urban in the remaining parts - 8 000.

Communications

The main road through Miri leads northwards to Brunei and southwards through the Study Area to Bintulu. It is an unsealed, all-weather road as are most of the feeder roads leading to the nearby agricultural areas.

The airport runway is being extended to enable medium sized jet-aircraft to use it. There are daily scheduled flights of the Malaysian Airline System to Kuching, Sibu, Bintulu, Brunei and Sabah.

The development of port facilities at Miri, like other coastal places in the Study Area, is hampered by shallow coastal waters and, in addition, there is a sand bar at the mouth of the Miri River which is the entrance to the harbour. The depth of water over the bar at high tide is about six feet. This allows only coastal vessels to enter the port. Larger ocean-going vessels have to anchor about three miles off-shore where there are special piped oil loading facilities; all other cargoes have to be transported between ship and shore by barge.

Agriculture

Compared with most other parts of the Fourth Division the Area is well developed.

The main agricultural areas are shown in Figure 2.1:

(a) Southwards from Miri along the coast and along the Miri-Bintulu road to the Tunku Abdul Rahman Village, including the Riam Road Bazaar. Here market gardening by Chinese small-holders is important. Vegetables and fruit are grown and pigs, poultry and fresh water fish are reared. There is also a total of about 7 000 acres of mature rubber plantations. Approximately 3 000 acres are of high yielding clones planted by the Department of Agriculture in the Lambir Small-Holder Rubber Planting Scheme. This is now controlled by SLDB, who have built a factory and smoke houses for processing latex collected by the small-holders into ribbed smoked sheets. The remaining 4 000 acres of rubber are privately planted and are handled individually by the owners. Most of it is concentrated around the village of Bakam;

(b) a swampy area just east of Miri town where rice has been produced for many years. Recently a Youth Settlement Scheme covering about 1 200 acres has been started there, and drainage works are being constructed by the Drainage and Irrigation Department.

Only schematic reconnaissance soil and terrain studies were undertaken in the Area by the Consultants (see Supporting Report No. 1 Part II). About 14 700 acres in a relatively narrow band along the coast south of Miri were identified as possibly suitable for agriculture. Much of this area is already occupied.

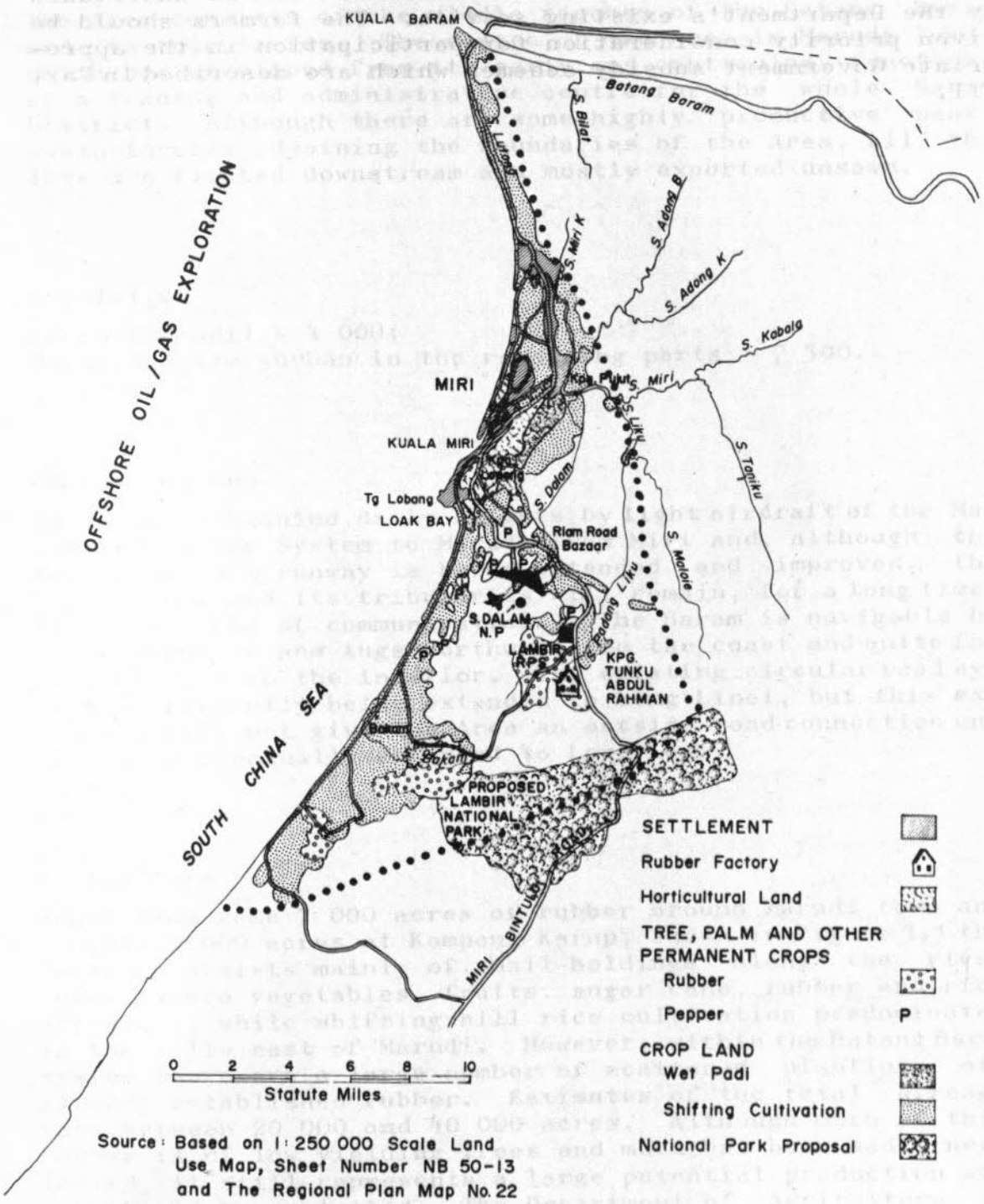
2.2 FUTURE AGRICULTURAL DEVELOPMENT

It is recommended that efforts should be directed at intensification and aimed mainly at the urban market, which is expected to increase to 40 000 by 1980 and 60 000 by 1990. Market gardening of vegetables, fruit, pepper and other spices together with pig, poultry and pond fish enterprises should be encouraged on the better soils on the undulating land. This should include the land presently planted to rubber when the trees have completed their economic life. In the Lambir Small-Holder Rubber Planting Scheme the cultivation of swamp rice in the flat valleys between the hills should be encouraged. The opening up of this land, if done correctly - employing drainage, levelling and bunding - would not be expected to have any deleterious effect on the Miri water supplies.

In the sandy soils close to the beach, combinations of coconuts and beef cattle, or cashew nuts and beef cattle, should be undertaken if and when such farming is proved economic by trials conducted by the Government Livestock Production and Animal Husbandry Training Centre.

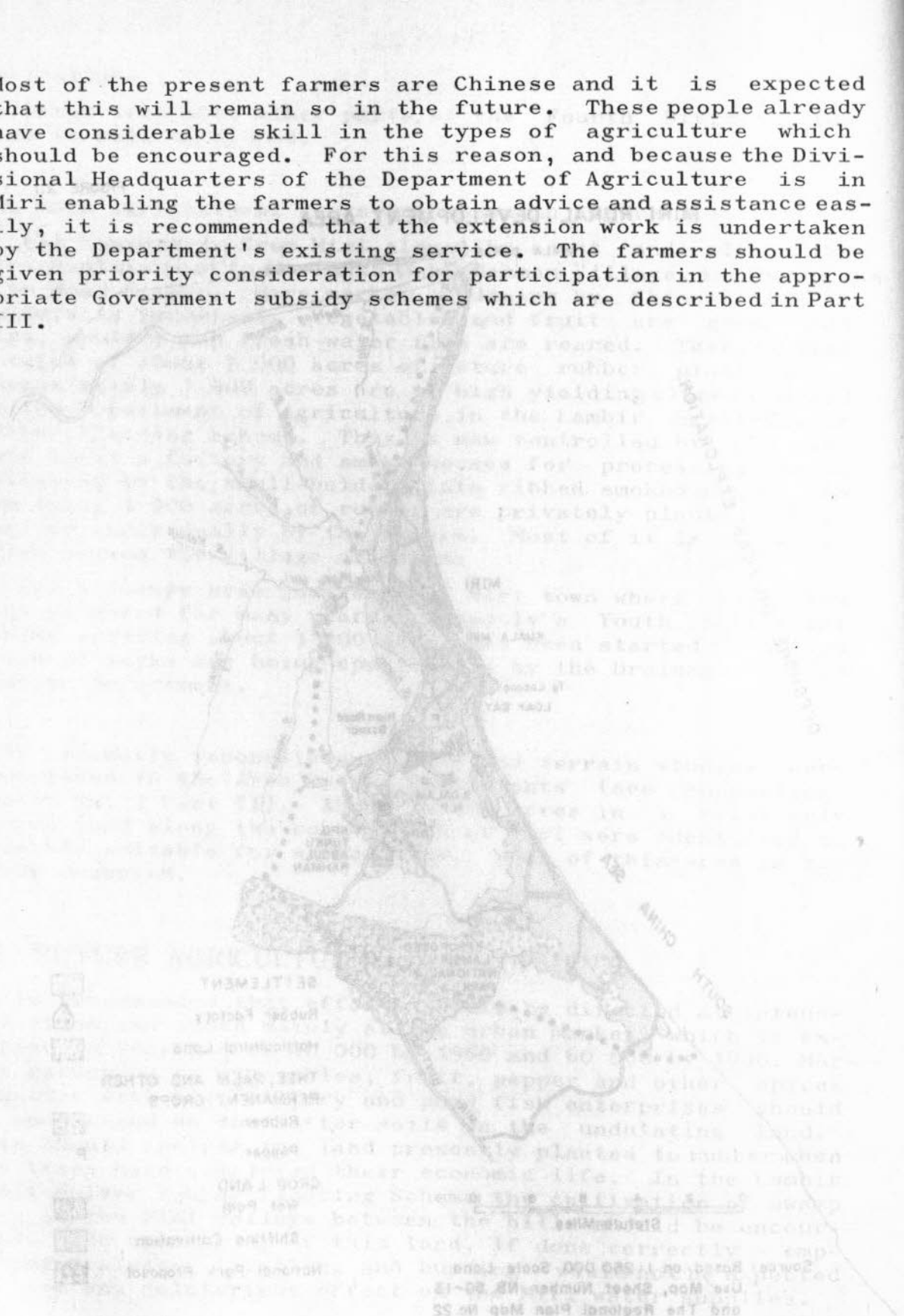
FIGURE 2.1

MIRI RURAL DEVELOPMENT AREA



Source: Based on 1:250 000 Scale Land Use Map, Sheet Number NB 50-13 and The Regional Plan Map No. 22

Most of the present farmers are Chinese and it is expected that this will remain so in the future. These people already have considerable skill in the types of agriculture which should be encouraged. For this reason, and because the Divisional Headquarters of the Department of Agriculture is in Miri enabling the farmers to obtain advice and assistance easily, it is recommended that the extension work is undertaken by the Department's existing service. The farmers should be given priority consideration for participation in the appropriate Government subsidy schemes which are described in Part III.



CHAPTER 3

THE MARUDI RDA

3.1 THE PRESENT SITUATION

General

The Area consists of the middle reaches of the Batang Baram and its tributaries. The centre of the Area is Marudi town, which has developed from its early and continuing function as a trading and administrative centre for the whole Baram District. Although there are some highly productive peat-swamp forests adjoining the boundaries of the Area, all the logs are floated downstream and mostly exported unsawn.

Population

Urban (Marudi) - 4 000;
Rural and semi-urban in the remaining parts - 7 500.

Communications

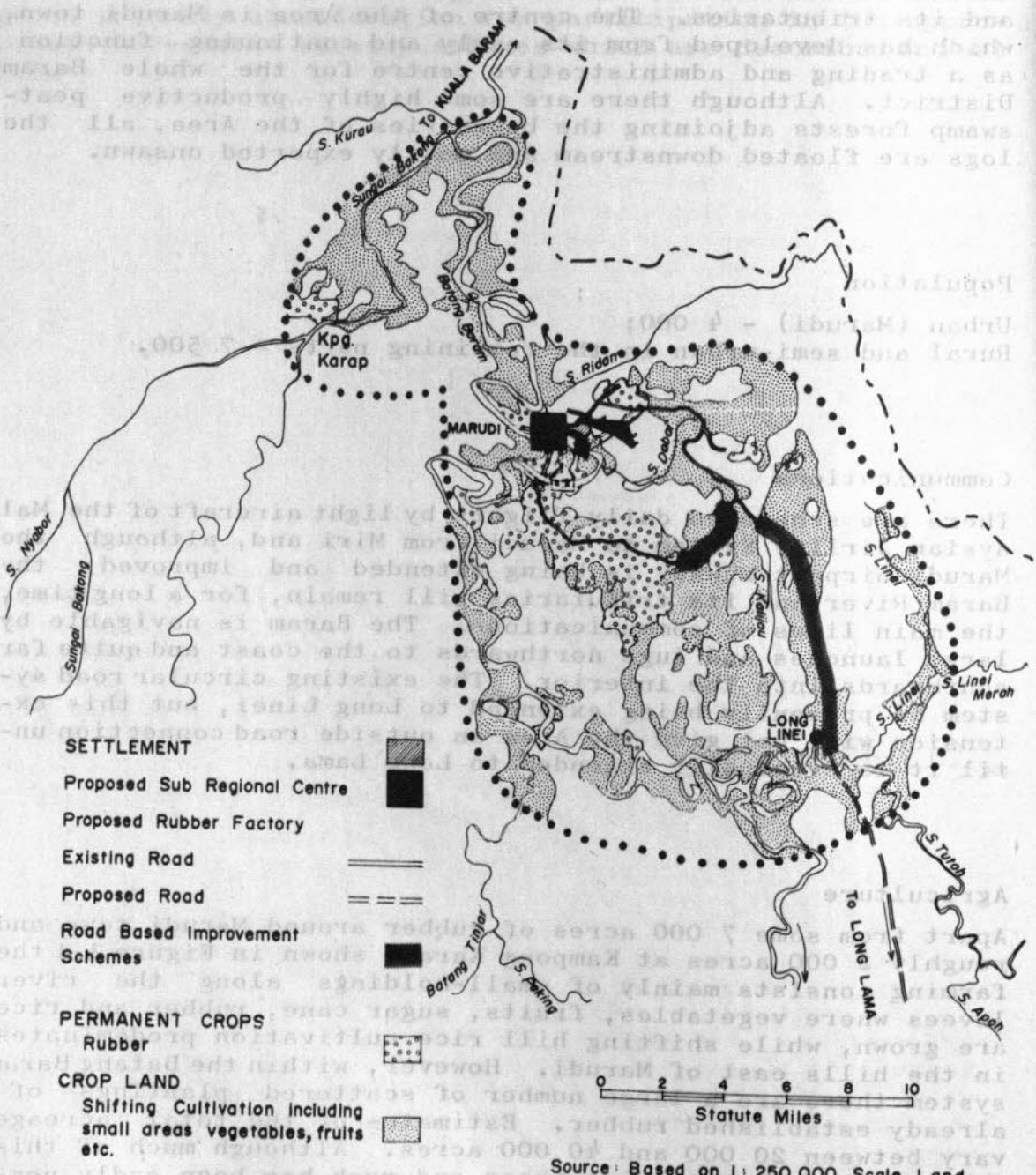
There are scheduled daily flights by light aircraft of the Malaysian Airline System to Marudi from Miri and, although the Marudi airport runway is being extended and improved, the Baram River and its tributaries will remain, for a long time, the main lines of communications. The Baram is navigable by large launches and tugs northwards to the coast and quite far southwards into the interior. The existing circular road system is presently being extended to Long Linei, but this extension will not give the Area an outside road connection until it is eventually extended to Long Lama.

Agriculture

Apart from some 7 000 acres of rubber around Marudi town and roughly 2 000 acres at Kampong Karap, shown in Figure 3.1 the farming consists mainly of small-holdings along the river levees where vegetables, fruits, sugar cane, rubber and rice are grown, while shifting hill rice cultivation predominates in the hills east of Marudi. However, within the Batang Baram system there are a large number of scattered plantings of already established rubber. Estimates of the total acreage vary between 20 000 and 40 000 acres. Although much of this rubber is of low yielding trees and much has been sadly neglected, it still represents a large potential production which should be exploited. The Department of Agriculture is presently undertaking a survey in an attempt to gauge the total potential yield and reliability of tapping this rubber.

FIGURE 3.1

MARUDI RURAL DEVELOPMENT AREA



Source: Based on 1: 250 000 Scale Land Use Map Sheet Number NB 50-13 and The Regional Plan Map No.22

3.2 FUTURE AGRICULTURAL DEVELOPMENT

Some 35 000 acres of mainly occupied land east and south-east of Marudi were identified during the schematic soil survey and terrain studies as possibly suitable for agriculture (see Supporting Report No. 1 Part II). These lands represent the main areas for agricultural development which should be aimed at the production of easily processed, easily transported, non-perishable products such as rubber, pepper, cashew nuts, anatto, robusta coffee and, if suitable land is found, cocoa. But any large scale planting of fruits and vegetables should not be encouraged because the main market for such products (Miri) is expected to be supplied locally.

Marudi town is not expected to expand much in the future because of the likely growth of Long Lama (see Chapter 5 and Supporting Report No. 5). However Marudi will continue to be the main trading centre for the whole Batang Baram system for several years, and will remain the centre for the middle reaches of the Baram river and its tributaries. It can therefore be used as a nucleus on which to base development in the area it will eventually serve.

It is recommended that this development should be based largely on the production of rubber. Marudi town is already a rubber collection and market centre and this function should be strengthened. For several years more the river, leading to Kuala Baram, will be the only marketing outlet for the whole catchment. Thus it should be simple to control the movement of rubber in the Area and direct it to Marudi. This would make the town an ideal site for a processing factory, but a special study of the feasibility of a factory is required before one is built because the potential for securing a reliable, steady supply of rubber from the existing plantings of scattered rubber is unknown. The Department of Agriculture is making this investigation. And although the prospects of the future rubber market have recently improved, the demands for specific types and grades of rubber are not clear. Therefore, although it is recommended that the aim for rubber should be increased future production, and every incentive should be given for improving marketing arrangements, the processing facilities should remain as at present; that is based on the production of air-dried and smoked ribbed sheets.

In order to increase future production and create a firm basis for future improved processing facilities it is proposed that there should be a road-based improvement scheme, in which rubber would be given high priority, along the existing circular road and the new road to Long Linei. To support these efforts it is recommended that the subsidised Rubber Planting Scheme is re-introduced into this specific Area.

The road-based improvement scheme has been planned to start in 1976 and be undertaken by a team from the ADU. Details of the ADU Centre proposed for establishment in Marudi are given in Part III. In Table 3.1 the staff build-up and estimated

TABLE 3.1 SUMMARISED STAFF BUILD-UP AND ACTIVITIES OF THE ADU CENTRE FOR ROAD BASED DEVELOPMENT IN THE MARUDI RDA UP TO 1981

Year	Total Staff by Sections					Estimated total number of farmers handled	Estimated annual acreage prepared for planting			
	Extension	Economic	Credit and Saving	Accounts	Total staff		Rubber	Cocoa	Rice	Pepper and other crops
1976	5	2	1	1	9	75	855	95	95	165
1977	5	2	1	1	9	105	345	45	45	75
1978	5	4	1	1	11	150	505	65	65	185
1979	7	5	1	2	15	200	565	65	65	115
1980	7	7	1	2	17	220	235	35	35	45
1981	7	7	1	2	17	250	325	45	45	65
Total by 1981	7	7	1	2	17	250	2 830	350	350	650

activities of the team are summarised. A semi-detailed soil survey would have to be carried out during 1975 along the roads concerned, covering about 5 000 acres. This survey would provide the information for planning the development to be undertaken by the ADU Teams.

CHAPTER 4

THE LAMBIR-SUBIS RDA

4.1 THE PRESENT SITUATION

General

All forest in this Area, except that in the Niah National Park, has been exploited; but some valuable marketable timber still remains and salvage logging operations should be undertaken in all areas destined for agricultural development.

The central part of this Area was selected and planned in 1966/67 as the Lambir-Subis Development Area. Large scale oil palm planting has since been undertaken by the SLDB and SOP. The Niah National Park, though not officially gazetted, has been under proposal since 1961. Much of the remaining land is already occupied, most of it for shifting cultivation of hill rice. Some of the occupation is illegal and adjudication by administrative officers will be necessary in many places before planned development can proceed. The unoccupied land is available for development to agriculture if semi-detailed soil surveys prove it suitable.

Bekenu and Beluru are small established towns, each with a bazaar and some Government offices. The Beluru bazaar, which was burned down in 1972, is being rebuilt by Government. A health centre has been built at a possible future service town site located on the Miri-Bintulu road between the SLDB Bukit Peninjau Scheme and the SOP estate.

Population

Urban (Bekenu) - 700;
Rural and semi-urban in the remaining parts - 21 300.

Communications

The all-weather Miri-Bintulu road passes right through the Area with other all-weather roads leading off it to Bekenu and Beluru. This latter road is currently being extended south-eastwards towards Long Lama.

The Sungai Niah and Sungai Sibuti are navigable by Chinese trading launches as far inland as Batu Niah and Bekenu respectively. However, the outlets to the sea of both the rivers have sand bars which, together with the shallow coastal waters. severely restrict the size of vessels that can enter or leave the rivers.

Agriculture

The SOP and SLDB oil palm plantings are estate-type undertakings covering, by the end of 1974, approximately 10 000 and 27 600 acres respectively. Planting started in 1969 and is still continuing. The SLDB in particular have a large clearing and planting programme for 1974. This includes the completion of clearing some 16 200 acres for oil palm planting, mainly in the Subis Scheme, 750 acres for the National Livestock Corporation in Karabungan and 500 acres for cocoa in Kabalang as shown in Figure 4.1. The earliest oil palm plantings, those of SOP, will come into bearing in early 1974 when the SOP palm oil mill is due for completion. It is designed to handle about 20 tons of fresh fruit bunches (ffb) per hour, a capacity which is expected to be a little in excess of the production from the SOP plantings. The intention has been to provide processing facilities for fruit from a limited area of oil palms planted by local farmers in the vicinity.

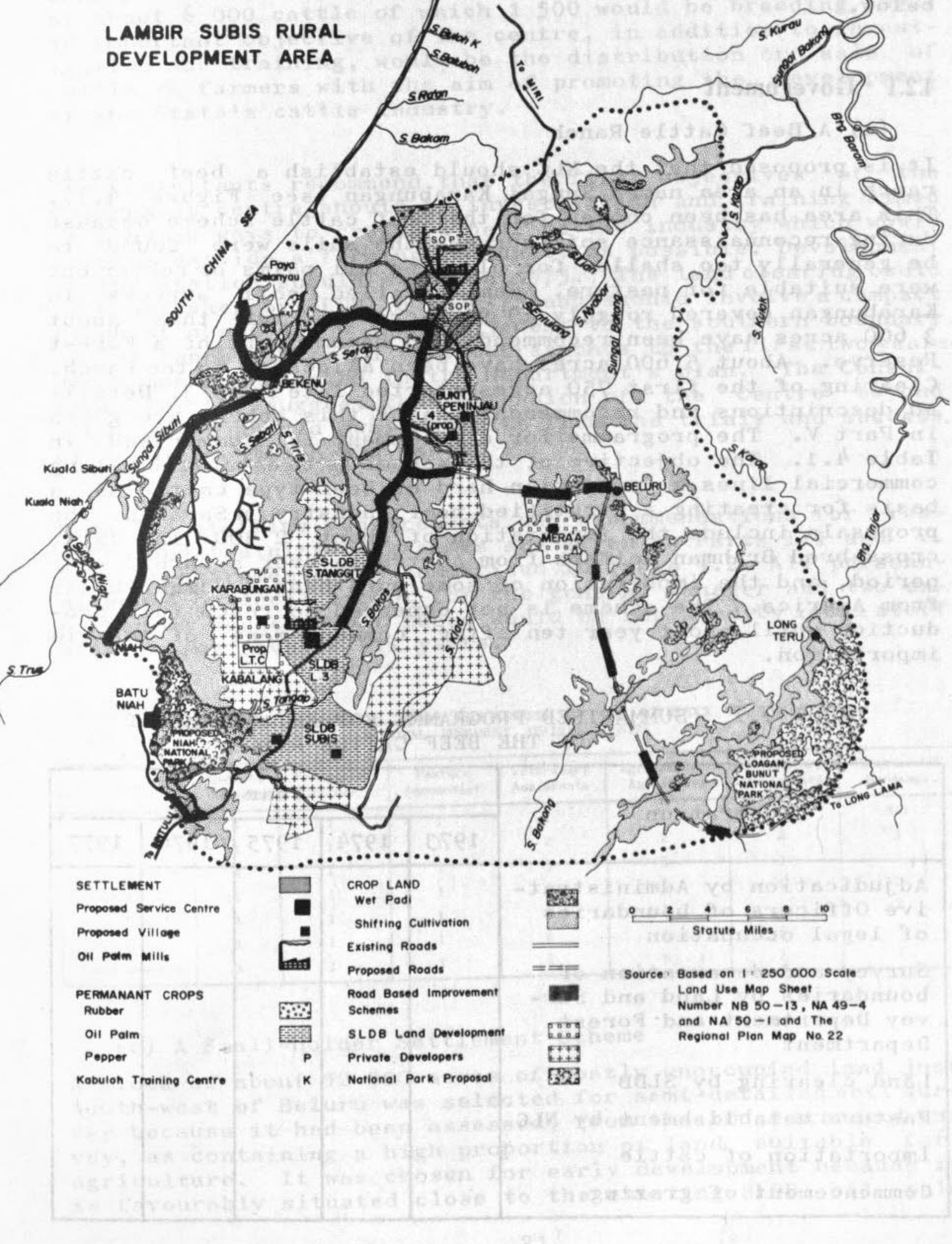
The SLDB mill currently being planned is expected to be located on the north-western boundary of the SLDB Subis Schemes and is expected to have an ultimate capacity of 60 tons of ffb per hour. The first stage should be operational in 1975. This mill too is expected to be able to process fruit from nearby private growers. The Department of Agriculture has already initiated a road-based scheme near Bukit Peninjau to plant 300 acres of oil palms on Native Customary Land during 1973/74.

Much of the agriculture in the occupied areas is shifting cultivation of hill rice, but there are considerable areas of Mixed Zone Land around Bekenu, along the road leading to it and along the Sibuti River. This land is mostly divided into small-holdings, issued under title, where swamp rice, fruit trees and rubber are grown. Also near Bekenu, at Paya Selanyau, there is a partially completed Government rice scheme where drainage and irrigation works are in hand. The works are planned to cover eventually about 3 350 acres. A rice testing station was opened there in 1972.

The cultivation of swamp rice is also practised quite extensively in the Native Customary Land along the road to Beluru and in swamp land east of the SOP estate. There are small, privately owned rubber holdings scattered throughout the occupied land.

Agricultural research for the Fourth and Fifth Divisions is centred at the Kabuloh Research Station. This is run by a graduate Research Officer with a relatively small supporting staff. Adjacent to this Station is the Kabuloh Farmers Training Institute with accommodation for 60 students. It was opened in 1971.

FIGURE 4.1


LAMBIR SUBIS RURAL
DEVELOPMENT AREA
SOUTH CHINA SEA
To MIRI
S. Buloh K
S. Batuban
S. Ratan
S. Bakam
S. Kurau
Sungai Bakong
Btg. Baram
Paya Selanyau
SOPT
SOP
K
S. Lian
S. Nyabor
S. Emuang
Sungai Bakong
S. Kubok
S. Setap
BEKENU
BUKIT PENINJAU
L. 4 (prop)
S. Sebati
S. Tiris
Sungai Sibuti
Kuala Sibuti
Kuala Niah
Sungai Niah
BELURU
S. Karap
MERA'A
Btg. Tinjar
SLDB S. TANGGIT
KARABUNGAN
S. Bakas
NIAH
S. Trus
Prop. L.T.C
SLDB L. 3
KABALANG
S. Tangap
LONG TERU
BATU NIAH
PROPOSED NIAH NATIONAL PARK
SLDB SUBIS
PROPOSED LOAGAN BUNUT NATIONAL PARK
To LONG LAMA
S. Bakong
To BINTULU
SETTLEMENT
Proposed Service Centre
Proposed Village
Oil Palm Mills
PERMANANT CROPS
Rubber
Oil Palm
Pepper
Kabuloh Training Centre
P
K
CROP LAND
Wet Padi
Shifting Cultivation
Existing Roads
Proposed Roads
Road Based Improvement Schemes
SLDB Land Development
Private Developers
National Park Proposal
0 2 4 6 8 10
Statute Miles
Source Based on 1: 250 000 Scale Land Use Map Sheet Number NB 50-13, NA 49-4 and NA 50-1 and The Regional Plan Map No. 22

4.2 FUTURE AGRICULTURAL DEVELOPMENT

The SLDB and SOP oil palm estates form nuclei on which future expansion has been planned. Responsibility for the development envisaged has been allocated to Government institutions including the National Livestock Corporation (NLC), the SLDB and the Department of Agriculture as well as private agencies. The roles of each of these in this RDA are described below.

4.2.1 Government

(a) A Beef Cattle Ranch

It is proposed that the NLC should establish a beef cattle ranch in an area named Sungai Karabungan (see Figure 4.1). This area has been chosen for the beef cattle scheme because during reconnaissance soil surveys the soils were found to be generally too shallow for planting oil palms or rubber but were suitable for pasture. Semi-detailed soil surveys in Karabungan covered roughly 19 950 acres and of this about 3 600 acres have been recommended to become part of a Forest Reserve. About 5 600 acres have been allocated to the ranch. Clearing of the first 750 acres started late in 1973. Detailed descriptions and recommendations of this scheme are given in Part V. The programme for development is summarised in Table 4.1. The objective of the scheme is to establish, along commercial lines a foundation herd of beef type cattle as a basis for creating a stratified beef industry in Sarawak. The proposals include the importation of about 2 300 in-calf, cross-bred Brahman heifers from Australia over a three year period, and the importation of some pure bred Brahman bulls from America. The scheme is not expected to reach full production until about year ten after commencement of cattle importation.

TABLE 4.1 SUMMARISED PROGRAMME FOR ESTABLISHMENT OF THE BEEF CATTLE RANCH

Operation	Year				
	1973	1974	1975	1976	1977
Adjudication by Administrative Officers of boundaries of legal occupation					
Survey and demarcation of boundaries by Land and Survey Department and Forest Department					
Land clearing by SLDB					
Pasture establishment by NLC					
Importation of cattle					
Commencement of grazing					

(b) A Livestock Production and Animal Husbandry Training Centre

The Sarawak Department of Agriculture plans to establish this centre (Lim, C.P., Chua, C.K., 1973). The scheme, which would be located adjacent to the NLC ranch, would entail the establishment of a 2 500 acre centre for cattle production, training and investigation into beef production and pasture husbandry. When fully established the centre would have a herd of about 6 000 cattle of which 1 500 would be breeding cows. An important objective of the centre, in addition to investigation and training, would be the distribution or sale of cattle to farmers with the aim of promoting the development of the State's cattle industry.

The Consultants recommend that the first objectives of the Government centre should be investigation and training aimed at finding ways to create a beef cattle industry which would involve as wide a farming community as possible. Development of the Station should start in 1975. The land clearing could be undertaken by SLDB in 1974/75 and should involve a compact block of about 1 000 acres adjacent to the southern boundary of the ranch. This in fact corresponds to the first two years development envisaged in the Department's plan. The Consultants further suggest that extension of the Centre beyond 1 000 acres should await results from the trials and success of developments on the ranch.

Detailed staffing requirements and recommendations for research and training programmes are given in Parts III and V. Staff requirements are summarised in Table 4.2. All personnel would be local except for the general manager and two experienced herdsmen but these would be replaced by local staff after about five or six years.

TABLE 4.2 ESTIMATED TECHNICAL STAFF REQUIREMENTS FOR THE LIVESTOCK PRODUCTION AND ANIMAL HUSBANDRY TRAINING CENTRE

Year	General Manager	Veterinary Officer	Pasture Agronomist	Veterinary Assistants	Agricultural Assistants	Laboratory Assistants	Experienced Herdsmen
1	1	1	1	1	1	1	Nil
2	1	1	1	2	2	2	1
3	1	1	1	3	3	3	2
4	1	1	1	4	4	4	2
5	1	1	1	4	4	4	2
6	1	1	1	4	4	4	2
7 and onwards	1	1	1	4	4	4	2

(c) A Small-Holder Settlement Scheme

A block of about 12 900 acres of mostly unoccupied land just south-west of Beluru was selected for semi-detailed soil survey because it had been assessed, from the broad transect survey, as containing a high proportion of land suitable for agriculture. It was chosen for early development because it is favourably situated close to the existing SLDB oil palm

plantings and the Government bazaar-building activities at Beluru, and close to the road being constructed towards Long Lama.

Based on the findings of the semi-detailed soil survey the area has been subdivided for development as follows (see also Figure 4.2):-

6 550	acres allocated to Forest Reserve proposals 3 750 acres to Ulu Selepin 2 800 acres to Bakas
4 575	acres allocated to development by SLDB to agriculture, of which roughly 875 acres should remain as Communal Forest enclaves
770	acres allocated to development by private enterprise to agriculture, of which 210 should remain as forest enclaves
430	acres considered legally occupied and therefore not included in the detailed planning
570	acres of flood-prone valley land also not included in the detailed planning
Total 12 895	

Roughly 4 400 acres of the land allocated to agriculture is logged forest, but is still under licence and requires salvage logging. This must be cleared by mid 1974.

Because of the favourable development factors associated with Mera-a it is recommended as the first area to be developed by SLDB to a diversified cropping pattern for the subsequent establishment of small-holders. The proposal is that Sarawak citizens, who have proved themselves as good potential small-holders by their work with SLDB in the existing oil palm schemes, and wish to become small-holders, should be selected and transferred to Mera-a for working. Here they would, by stages, eventually become small-holders in accordance with the policies and procedures described in Part I. The development of Mera-a along these lines can be considered a trial for the system because, in the overall plan, work here would commence two years before the next area proposed for similar development.

Within roughly 1.5 miles of the proposed village of Mera-a (see Figure 4.2) there are approximately 3 705 acres of land assessed as suitable for agriculture. Of this about 1 240 acres have been occupied by shifting cultivators since the compiling of the 1:250 000 Land Use Maps Series No. 22. Adjudication by Administrative Officers will be necessary to determine the legal boundaries before development starts. The land allocated to private development commences about two miles to the south-east of the village site.

The detailed programmes for administration, forestry, and

FIGURE 4.2

MERA - A SETTLEMENT SUB SCHEME

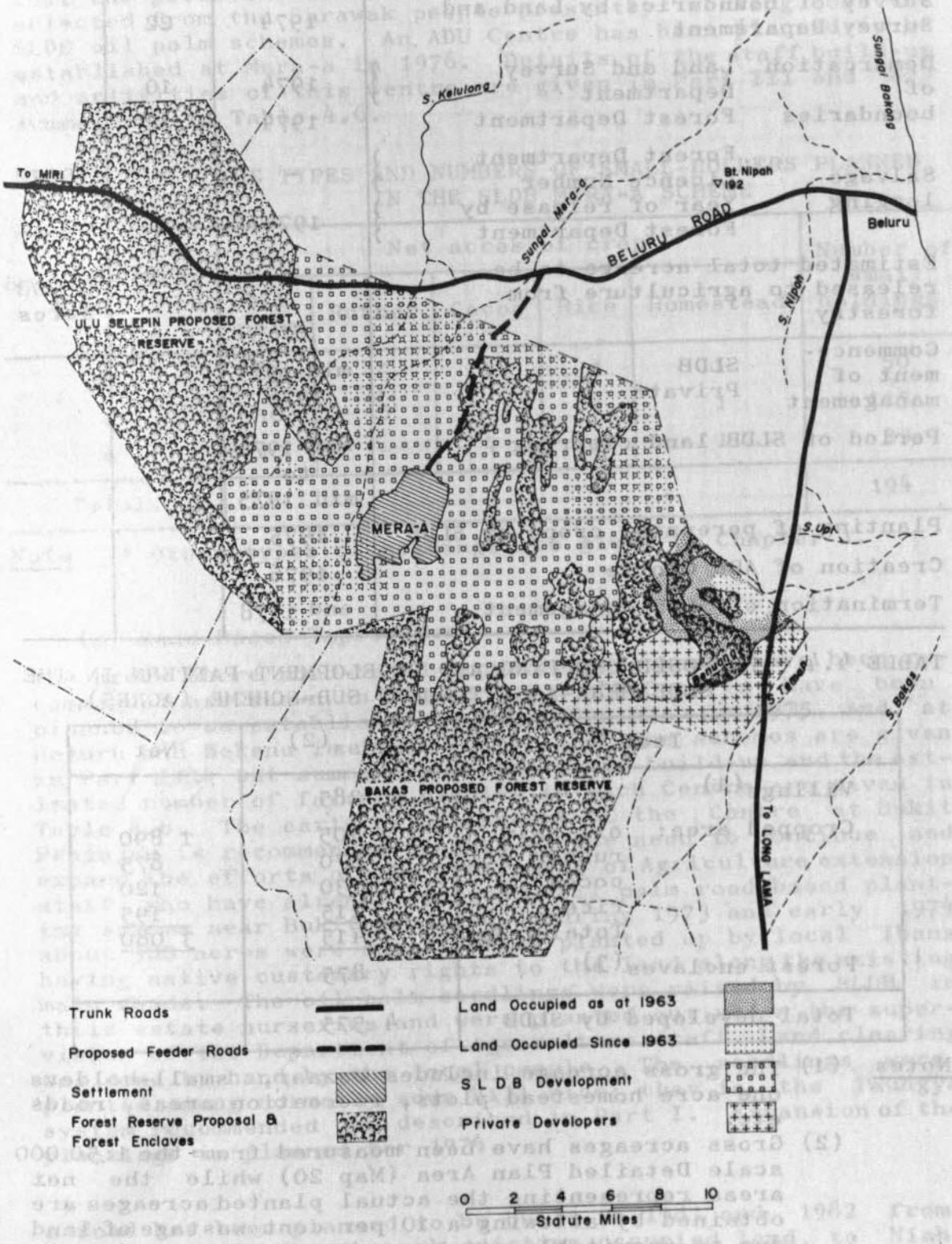


TABLE 4.3 PROPOSED PROGRAMME OF ACTIVITIES FOR LAND ALLOCATED TO SLDB AND PRIVATE DEVELOPERS

Detail		Year	Miles	
Adjudication by Administrative Officers of boundaries of legal occupation		1974	-	
Survey of boundaries by Land and Survey Department		1974	22	
Demarcation of boundaries	Land and Survey Department	1974	10	
	Forest Department	1974	12	
Salvage logging	Forest Department Licence Number	-	-	T0072
	Year of release by Forest Department	1974	-	
Estimated total acreage to be released to agriculture from forestry				4 700 acres
Commencement of management	SLDB	mid 1974		
	Private	1976		
Period of SLDB land clearing		mid 1974 to mid 1975		
Planting of perennial crops by SLDB		1975		
Creation of ADU Centre		1976		
Termination of SLDB Management		end 1978		

TABLE 4.4 PROPOSED CROPPING AND DEVELOPMENT PATTERN IN THE SLDB MERA-A SETTLEMENT SUB-SCHEME (ACRES)

Item		Gross(2)	Net
Village(1)		285	
Cropped area:	oil palm	2 105	1 890
	rubber	970	875
	cocoa	130	120
	rice	215	195
	Total crops	3 415	3 080
Forest enclaves(3)		875	
Total developed by SLDB		4 575	

Notes (1) The gross acreage includes bazaar, small-holders one acre homestead plots, recreation areas, roads etc.

(2) Gross acreages have been measured from the 1:50 000 scale Detailed Plan Area (Map 20) while the net areas representing the actual planted acreages are obtained by allowing a 10 per cent wastage of land due to unsuitable patches, roads and drains.

(3) The forest enclaves represent areas unsuitable for agriculture and are planned to remain under forest and be gazetted as Communal Forests. Small areas of less than 50 acres have been included in the agricultural development.

agricultural development for the whole area are given in Table 4.3. In Table 4.4 the proposed cropping pattern for the SLDB developed land is given, while Table 4.5 shows the numbers and types of small-holdings in this area. It is recommended that the potential small-holders required in 1975 should be selected from the Sarawak people presently working on the SLDB oil palm schemes. An ADU Centre has been planned to be established at Mera-a in 1976. Details of the staff build-up and activities of this Centre are given in Part III and are summarised in Table 4.6.

TABLE 4.5 THE TYPES AND NUMBERS OF SMALL-HOLDERS PLANNED IN THE SLDB MERA-A SCHEME

Small-holding type*	Net acres of crop					Number of small holdings
	Oil palm	Rubber	Cocoa	Rice	Homestead	
a	9	6	-	1	1	50
b	10	5	-	1	1	115
c	10	-	4	1	1	29
Total						194

Note * Other types of holdings are given in Chapter 1.

(d) Road-Based Improvement

The areas where road-based improvement schemes have been recommended are shown on Figure 4.1. ADU Centres have been planned to be established at Bukit Peninjau in 1975, and at Beluru and Bekenu in 1976. Details of the schemes are given in Part III, but summaries of the staff build-up and the estimated number of farmers handled in each Centre are given in Table 4.6. The early establishment of the Centre at Bukit Peninjau is recommended because of the need to continue and expand the efforts of the Department of Agriculture extension staff, who have already started an oil palm road-based planting scheme near Bukit Peninjau. During 1973 and early 1974 about 300 acres were successfully planted up by local Ibans having native customary rights to the land along the existing main roads. The oil palm seedlings were raised by SLDB in their estate nurseries and were planted out under the supervision of the Department of Agriculture staff. Land clearing was done by hand by the local people. The seedlings were planted among normally sown hill rice; that is the Taungya system recommended and described in Part I. Expansion of the plantings is planned for 1974.

A road has been planned to be built in 1981 and 1982 from Bekenu southwards, through existing occupied land, to Niah. This road would provide the opportunity to extend road-based improvement into this presently remote and isolated area.

TABLE 4.6 SUMMARY OF STAFF BUILD UP AND ACTIVITIES OF THE ADU CENTRES IN THE LAMBIR SUBIS RDA

CENTRES	Year	Total Staff by Sections					Estimated total number of farmers handled	Estimated annual acreage supervised (1)				
		Extension	Economic	Credit and Saving	Accounts	Total staff		Oil palm	Rubber	Cocoa	Rice	Other crops and enterprises
MERA-A	1976	6	2	1	1	10	194	Nil	Nil	Nil	194	194
	1977	6	2	1	1	10	194	Nil	Nil	Nil	194	194
	1978	6	2	1	1	10	194	Nil	Nil	Nil	194	194
	1979	8	6	3	2	19	194	1 890	875	120	194	194
		Situation expected to remain similar for several years										
BUKIT PENINJAU	1975	5	2	1	1	9	75	425	495	95	75	115
	1976	5	2	1	1	9	105	175	205	45	35	35
	1977	5	4	1	1	11	150	255	295	65	45	75
	1978	7	5	1	2	15	200	285	325	65	55	75
	1979	7	7	1	2	17	220	125	145	25	25	35
	1980	12	8	1	2	23	325	585	685	135	105	165
	1981	12	9	1	2	24	355	175	205	45	35	55
	Total up to 1981	12	9	1	2	24	355	2 025	2 355	475	375	575
BELURU AND BEKENU	1976	5	2	1	1	9	75	425	495	95	75	115
	1977	5	2	1	1	9	105	175	205	45	35	55
	1978	5	4	1	1	11	150	255	295	65	45	75
	1979	7	5	1	2	15	200	285	325	65	55	75
	1980	7	7	1	2	17	220	125	145	25	25	35
	1981	12	8	1	2	23	325	585	685	135	105	165
	Total up to 1981	12	8	1	2	23	325	1 850	2 150	430	340	520

(1) For Bukit Peninjau, Beluru and Bekenu ADU road based improvement centres, read prepared for planting.

4.2.2 Private Agencies

Private development to be undertaken by individuals or by companies is recommended in several blocks of land in addition to that adjacent to Mera-a. Some of these areas have been soil surveyed at the semi-detailed level by the Soil Survey Division of the Department of Agriculture. Other areas will require such soil surveys before their development can be planned in detail. The location of these areas are shown in Figure 4.1. The programmes for future investigations and recommended development are given in Table 4.7. Their development would form an integral part of the whole plan for the RDA.

4.2.3 Future Oil Palm Processing Capacity

The expected total acreage of oil palms in the RDA by the end of 1974 is:-

TABLE 4.7 PROGRAMME AND RECOMMENDATIONS FOR PRIVATE DEVELOPMENT IN THE LAMBIR SUBIS RDA

OPERATION			NAME OF BLOCK OF LAND						
			KARABUNGAN	MERA-A	ULU MAMAT	MENATAN	ULU KLAD	SUNGAI KLAD	ULU MASIAT
Semi detailed Soil Survey		Year	*	*	1974	**	1974	1975	1974-5
		Acres	6 800	770	3 150	6 400	2 890	17 000	5 500
Adjudication by Administrative Officers of boundaries of legal occupation		Year	1974	*** 1974	1974	1974	not necessary	1975	1975
Survey of boundaries by Land and Survey Department		Year	1974	*** 1974	1974	1974	1975	1975	1975
		Miles	16	22	6	20	****	35	10
Demarcation of boundaries	Land and Survey Department	Year	1974	*** 1974	1974	1974	1975	1975	1975
		Miles	8	10	5	20	****	25	2
	Forest Department	Year	1974	*** 1974	1974	-	1975	1975	1975
		Miles	8	12	1	Nil	****	10	8
Salvage Logging	Forest Department Licence No		T0071	T0072	T0072	T0071	T0072	T0072	T0091
	Year of release by Forest Department		1978	1974	1975	1975	1975	1977	1976
Estimated total acreage to be released to agriculture			6 800	770	2 200	4 500	2 000	14 000	3 800

REMARKS AND RECOMMENDATIONS FOR AGRICULTURAL DEVELOPMENT

Name of block of land		Name of block of land	
KARABUNGAN	This is the unoccupied land remaining in the Karabungan semi-detailed soil surveyed area after deducting the occupied areas (2 900 acres) and after allocation: to the beef ranch of 5 650 acres, to the Livestock Production and Animal Husbandry Training Centre 1 000 acres and to the Forest Department 3 600 acres. The 6 800 acres are recommended for development, mainly to beef cattle, by private agencies after research and demonstration has shown the techniques and viability of particular systems of beef cattle farming. This is assumed to be by 1978. The Government livestock centre may require 1 500 acres of this land.	ULU KLAD	Recommended for development as medium sized private farms. The area is well situated for planting mainly to oil palm. The estimated net acres of crops planted are:- oil palm 1 260, rubber 360, cocoa 115, rice 65.
MERA-A	This is the unoccupied land more than 1.5 miles from the site of the proposed Mera-a village and therefore considered unsuitable for allocation to small holders living in the village. It is recommended that it be developed as small private farms starting in 1976. The actual number and size of farms will depend on the applications government receives after advertising the land for private development. The cropping pattern should be based on the information of the semi-detailed soil survey which shows that the net acreages of crops that could be grown are:- oil palm 355, rubber 100, cocoa 30, rice 20.	SUNGAI KLAD	Early action is needed to establish fixed legal boundaries because illegal occupation is continuing on all sides. Recommended for development as large sized private farms starting in 1978 whereas oil palm should be the main crop, diversification into rubber, cocoa, swamp rice and later perhaps beef cattle could be undertaken. After identification of the land suitable for agriculture an access road will need to be constructed before agricultural development can commence. The estimated net acres of planted crops are oil palm 8 820, rubber 2 520, cocoa 820, rice 440.
ULU MAMAT	Recommended for development as small sized private farms. It is well situated for planting mainly to oil palm. The estimated cropping pattern in net acres is oil palm 1 385 acres, rubber 395 acres, cocoa 130, rice 70 acres.	ULU MASIAT	The area is easily reached from the Miri Bintulu road and is close to the proposed SLDB oil palm mill. It is recommended for release to development in 1977. It should be allocated as medium private farms growing mainly oil palm. The estimated net acres of crops planted are:- oil palm 2 395, rubber 685, cocoa 220, rice 120.
MENATAN	There is dispute between two local groups of people over the right to part of this land. This must be resolved before any development can take place. The area remaining outside the legitimate claims of the local people should be developed as medium and large private enterprises. The farming over the whole area could consist of a combinations of oil palm, rubber, cocoa, rice and beef cattle. For calculation purpose the net acres in each enterprise are estimated as:- beef cattle 2 500, oil palm 1 085, rubber 310, cocoa 100, rice 55.	Footnotes: * Completed by the Consultants ** Partly completed by Department of Agriculture *** Included with the small holder scheme **** Included with Sungai Klad	

SOP	10 000 acres
SLDB	26 700 acres
Road-based (say)	500 acres
	37 200 acres

The SOP and SLDB mills together will have a planned capacity of 80 tons ffb per year. This is estimated to be sufficient to handle the produce from roughly 40 000 acres of palms in full bearing, and, allowing for some flexibility in the processing capacity of each mill, there should be no need to build other mills before 1980. This aspect is further discussed in Appendix II.

CHAPTER 5

THE LONG LAMA RDA

5.1 THE PRESENT SITUATION

General

The township of Long Lama is a typical up-country small bazaar town having developed from one of the more flourishing longhouses. There is a small Department of Agriculture Station close to the town as well as a few administrative and school buildings.

East, south-east and south of Long Lama are large areas of unexploited Mixed Dipterocarp Forests.

Population (1970)

Urban (Long Lama) - 600;
Rural and semi-urban in the remaining parts - 4 900.

Communications

Only the River Baram provides any line of communication, leading northwards to Marudi, some 50 miles away, and southwards to the interior.

Agriculture

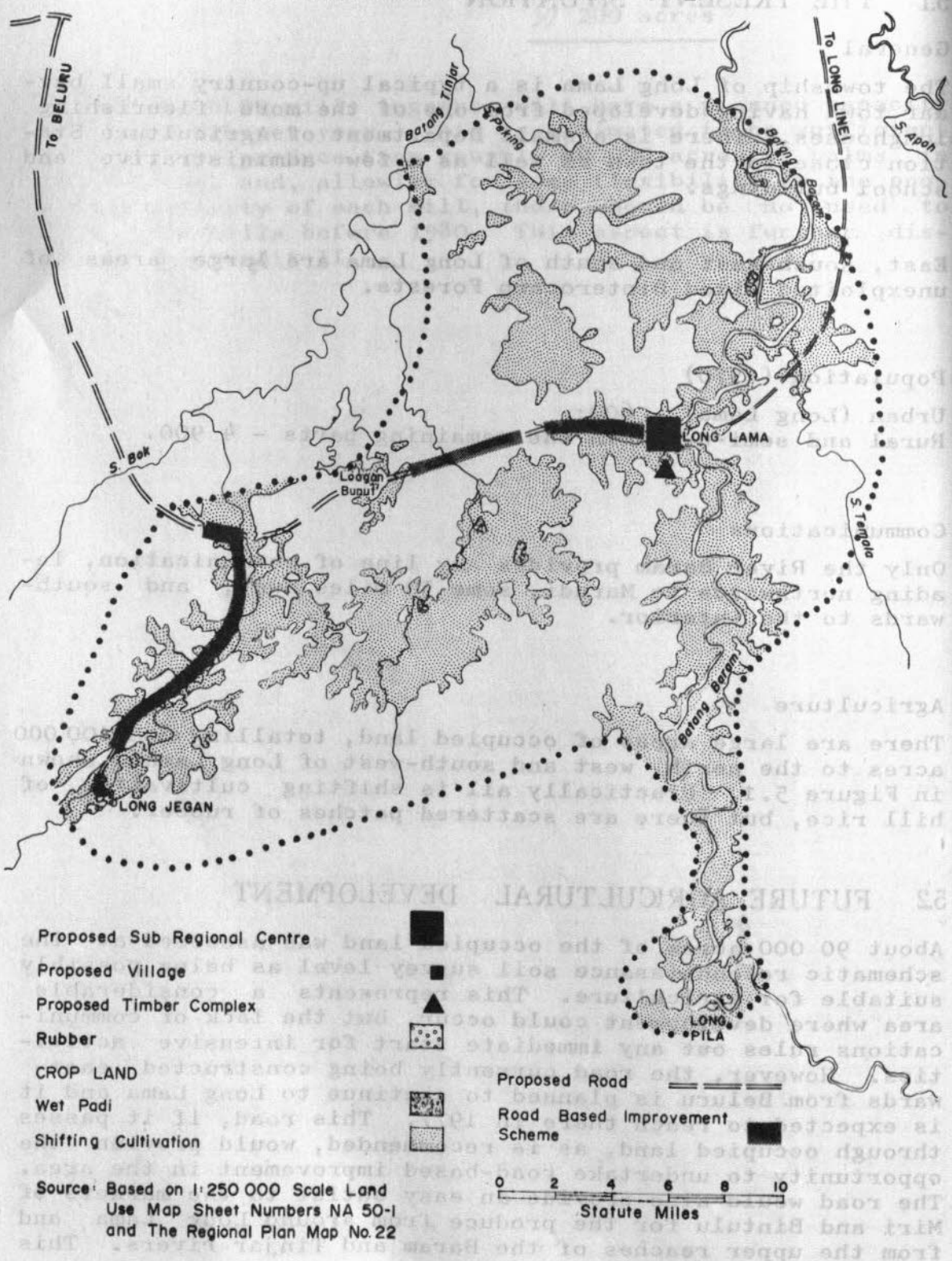
There are large areas of occupied land, totalling over 100 000 acres to the north, west and south-west of Long Lama as shown in Figure 5.1. Practically all is shifting cultivation of hill rice, but there are scattered patches of rubber.

5.2 FUTURE AGRICULTURAL DEVELOPMENT

About 90 000 acres of the occupied land was assessed at the schematic reconnaissance soil survey level as being possibly suitable for agriculture. This represents a considerable area where development could occur, but the lack of communications rules out any immediate start for intensive activities. However, the road currently being constructed eastwards from Beluru is planned to continue to Long Lama and it is expected to reach there in 1977. This road, if it passes through occupied land, as is recommended, would provide the opportunity to undertake road-based improvement in the area. The road would also provide an easy outlet to the markets of Miri and Bintulu for the produce from around Long Lama and from the upper reaches of the Baram and Tinjar rivers. This

FIGURE 5.1

LONG LAMA RURAL DEVELOPMENT AREA



Source: Based on 1:250 000 Scale Land Use Map Sheet Numbers NA 50-1 and The Regional Plan Map No. 22

diversion of trade would reduce the volume of goods handled by Marudi. Thus Long Lama is expected to grow at the expense of Marudi.

It is proposed that road-based improvement should be conducted by an ADU Centre established in Long Lama as soon as the road reaches there. The area is too far from any proposed oil palm mill to justify the encouragement of oil palm planting. Therefore agriculture should follow the same pattern as is proposed for Marudi; the production of easily processed, easily transported non-perishable goods, rubber being the most important. But this is an ideally situated area in relation to the Karabungan beef ranch for the extension of beef enterprises once the techniques have been worked out and steers for farming-out become available. Details of the proposed ADU Centre are given in Part III and are summarised in Table 5.1. Semi-detailed soil surveys covering a total of about 5 500 acres of land on either side of the road would have to be carried out during 1976.

After 1980 further road-based improvement could be undertaken along a new road expected to be constructed southwards from the Long Lama road to Long Jegan. This road would eventually be connected with a road planned to extend northwards from Tubau (see Chapter 8). The alignments of these roads should be through occupied land assessed as having agricultural development potential.

TABLE 5.1 SUMMARY OF STAFF BUILD-UP AND ACTIVITIES UP TO 1981 OF THE ADU CENTRE AT LONG LAMA FOR ROAD BASED IMPROVEMENT

Year	Total Staff by Sections					Estimated total number of farmers handled	Estimated annual acreage prepared for planting			
	Extension	Economic	Credit and Saving	Accounts	Total staff		Rubber	Cocoa	Rice	Pepper and other crops
1977	5	2	1	1	9	75	855	95	95	165
1978	5	2	1	1	9	105	345	45	45	75
1979	5	4	1	1	11	150	505	65	65	185
1980	7	5	1	2	15	200	565	65	65	115
1981	7	7	1	2	17	220	235	35	35	45
Total up to 1981	7	7	1	2	17	220	2 505	305	305	585

CHAPTER 6

THE NIAH-SUAI RDA

6.1 THE PRESENT SITUATION

General

This Area lies between two rivers, the Sungai Niah in the north and the Batang Suai in the south. The only two existing towns, Niah and Batu Niah are situated on the Sungai Niah. Both towns are typical small country settlements.

About half the forest has already been exploited. Logging is continuing in the central part, while in the south-east there is virgin forest which forms part of the forest planned for harvesting by a forest industry complex, FAO Unit 3 (see Supporting Report No. 3 Part I). In the Niah Forest Reserve important forest regeneration experiments have recently been started by the Forest Department. The experimental plots are in three separate blocks (FRP 53, FRP 68 and FINV 51) the locations of which are shown in Figure 6.1.

Just east of Batu Niah there are two stone quarries; a Government one and a privately owned one. These are the only easily accessible large sources of stone between Miri and Bintulu.

Population

Urban (Niah and Batu Niah) - 2 000;
Rural and semi-urban in the remaining parts - 2 000.

Communications

The all-weather Miri-Bintulu road runs right through the Area. The branch road to Batu Niah and Niah is also all-weather.

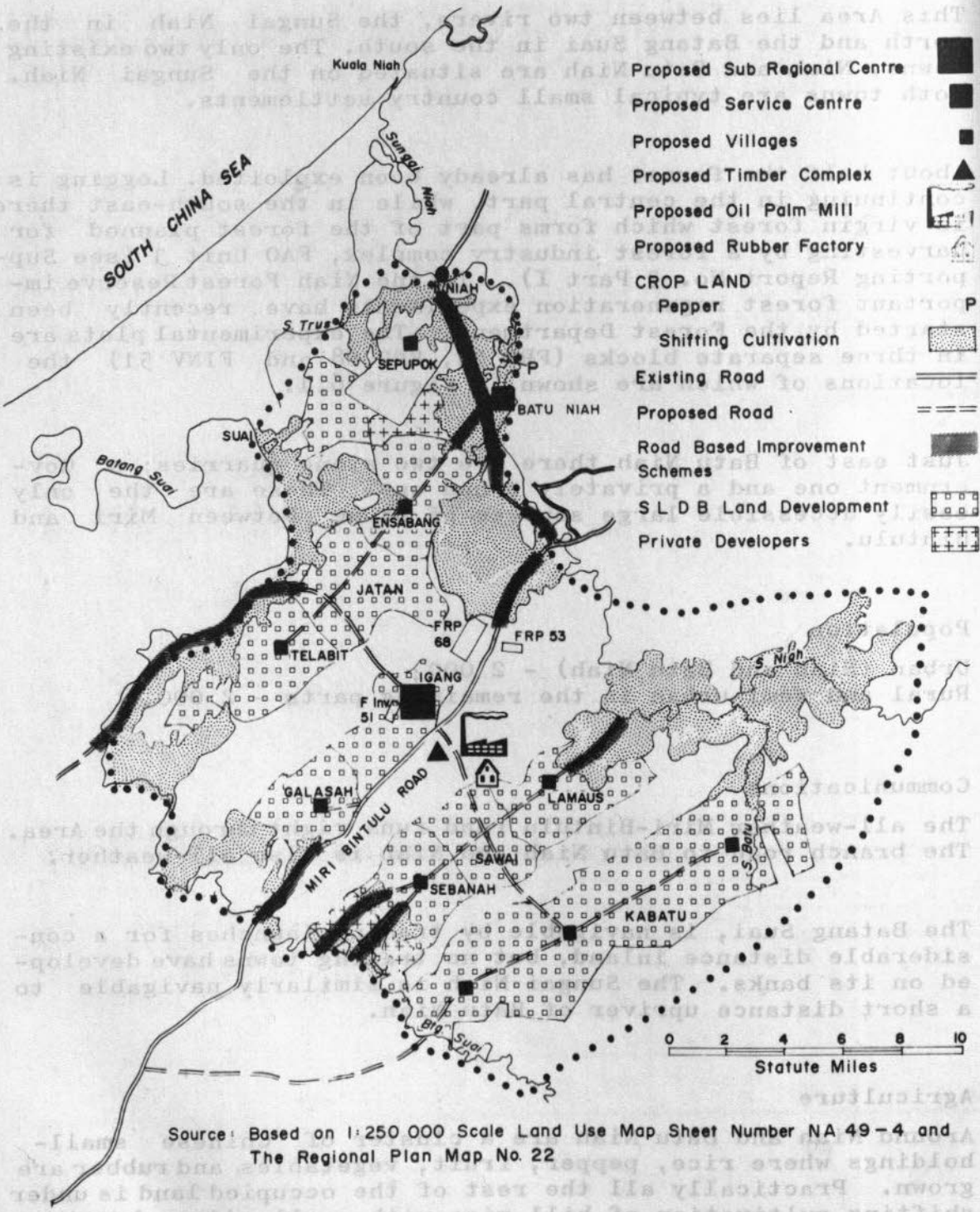
The Batang Suai, is navigable by trading launches for a considerable distance inland, but no trading towns have developed on its banks. The Sungai Niah is similarly navigable to a short distance upriver of Batu Niah.

Agriculture

Around Niah and Batu Niah are a cluster of Chinese smallholdings where rice, pepper, fruit, vegetables and rubber are grown. Practically all the rest of the occupied land is under shifting cultivation of hill rice with small rubber plantings scattered throughout.

FIGURE 6.1

NIAH – SUAI RURAL DEVELOPMENT AREA



Source: Based on 1:250 000 Scale Land Use Map Sheet Number NA 49 – 4 and The Regional Plan Map No. 22

During 1973 the Department of Agriculture started a block alienation settlement scheme at Sepupok. The scheme covers about 3 000 acres and has been planned to accommodate eventually 210 small-holder farmers who would develop a mixed cropping pattern based primarily on oil palms.

6.2 FUTURE AGRICULTURAL DEVELOPMENT

The early soil and terrain investigations carried out by the Consultants revealed that this general area contained the majority of the easily accessible already logged land suitable for agricultural development. Consequently semi-detailed soil surveys were largely concentrated here, eventually covering roughly 80 000 acres. The areas are shown in Figure 6.1. The land assessed as suitable for agriculture at the semi-detailed soil survey level are those subsequently planned as the major agricultural development effort in the period 1975 to 1980.

During the development planning a problem arose which has not been resolved. It is a conflict of interests over land totalling roughly 6 400 acres surrounding and containing the Forest Department experimental block F Inv 51. For development purposes the area, which contains about 4 600 acres of land suitable for agriculture, is ideally located for the siting of a sub-regional service centre which would have five villages around it, the whole making up a mutually dependant rural and urban complex that would warrant a high level of services. But the siting of the centre would eliminate, or severely reduce the value of, the research block. From the Forest Department's point of view the information sought from the trials, even though recently started, is so urgently required for correct management of the Mixed Dipterocarp Forests that it justifies re-siting the centre, even if at a less favourable location.

The Sarawak Government, represented by the Steering Committee, were unable to give a decision on this issue without full knowledge of the implications, therefore in this Report two alternative situations are presented. The one favoured by the Consultants, which incorporates the controversial area, is presented here and an alternative, which leaves the research block intact, is presented in Appendix I.

Roughly 78 600 acres were surveyed at the semi-detailed soil survey level, and on the results of the survey the area has been divided as follows:-

17 240 acres allocated to Forest Reserve;

54 750 acres allocated to development by SLDB to agriculture of which 3 760 have been occupied since publication of the 1:250 000 scale Land Use Maps, Series No. 22;

2 175 acres allocated for development by private enterprise;

4 430 acres assumed to be legally occupied because the areas are shown as cleared land on the Series No. 22 maps.

The total area for agricultural development is therefore approximately 61 360 acres but this includes forest enclaves on land unsuitable for agriculture.

The land allocated to SLDB for development has been divided into sub-schemes as shown in Figure 6.2 (and in more detail on the 1:50 000 scale Detailed Plan Area Map 20). The plans for development follow the principles described in Part I. Roughly 20 400 acres, consisting of sub-schemes Igang, Sawai and Jatan, have been proposed as a public estate which would contain and initiate the sub-regional centre (named for convenience Igang after a nearby prominent hill). The remaining 34 400 acres of SLDB allocated land have been planned to be developed by SLDB for subsequent subdivision into small-holdings. This part would consist of five villages (named Galasah, Sebanah, Lamaus, Ensabang and Telabit), each surrounded with developed land to a distance of about 1.5 miles. The unoccupied agricultural land outside this radius has been allocated to private development. Road-based improvement schemes have been planned for the areas assumed to be legally occupied.

The whole plan has been based on initial development by SLDB as explained in Part I. The estate would be the nucleus on which the rest of the development would depend for processing and marketing of its main product, oil palm and rubber. The oil palm plantings have been planned to reach eventually 30 000 acres, sufficient to justify the construction of a large central mill handling 60 tons of ffb per hour. This total acreage would not be achieved in the first five years of planned plantings and a continuation of similar type development would need to proceed into the area named Kabutu during 1980-1983. The rubber plantings, which are generally on the steeper or less accessible lands, have been designed to be sufficient to justify the establishment of a central processing factory, which could also cater for rubber from a much wider area. What type of rubber the factory should produce for market and what product the farmers should supply (whether latex, dried sheets or lump coagulum) are questions better answered nearer the time when the trees are approaching tapping age.

Cocoa processing (fermentation and drying) would take place in several conveniently located samoan-type processing units which would accept fresh wet beans from the farmers.

The proposed development programmes are given in Tables 6.1 and 6.2 while the number of small-holders and crop acreages in each SLDB sub-scheme are given in Table 6.3. The proposed cropping pattern for the SLDB developed area is shown in the 1:50 000 scale, Map 20 (in the Map Folder). Details of the

FIGURE 6.2

ORGANISATION OF DEVELOPMENT IN THE NIAH-SUAI DETAILED PLAN AREA

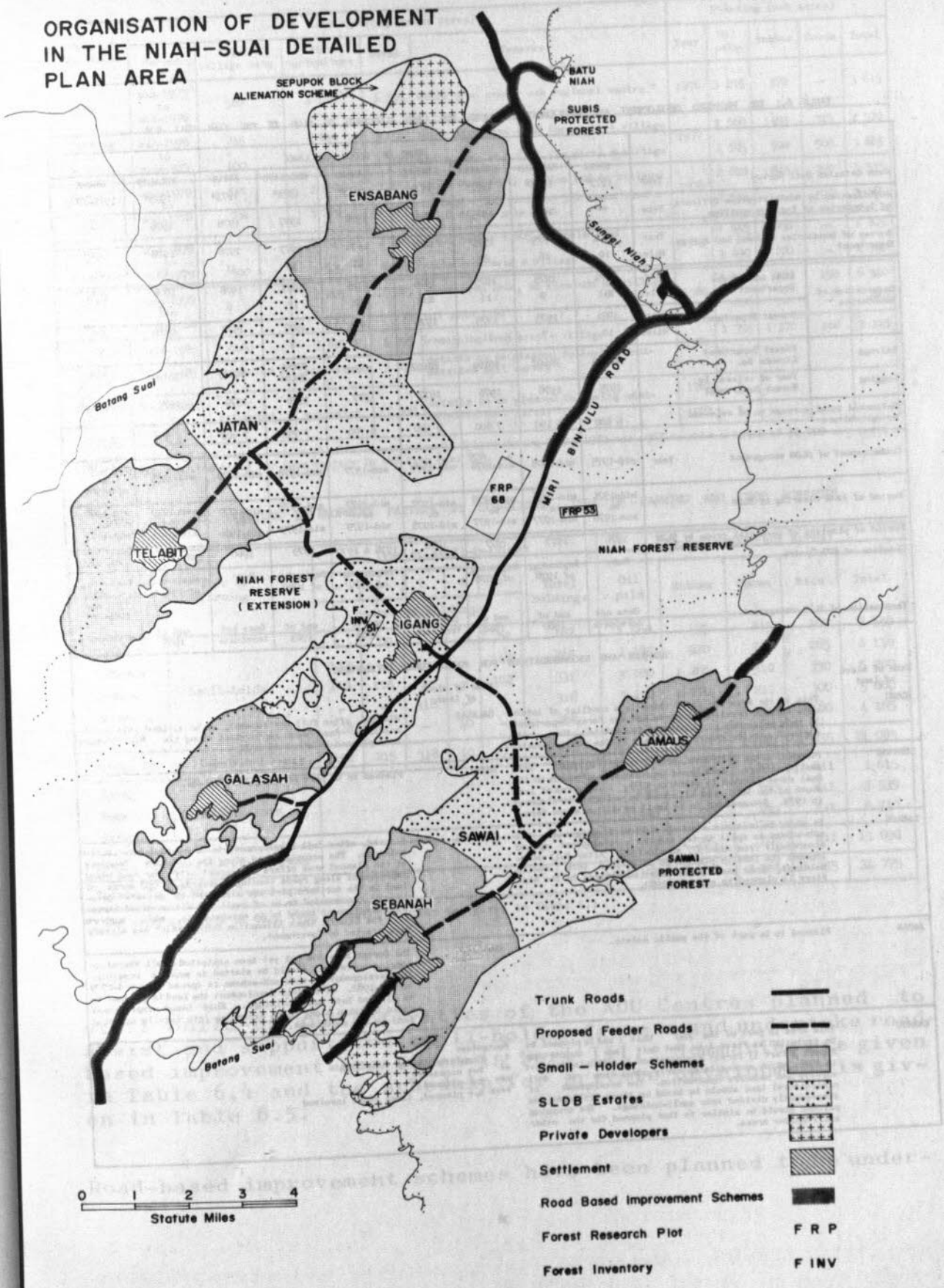


TABLE 6.1 THE PROPOSED DEVELOPMENT AND MANAGEMENT PROGRAMME FOR LAND ALLOCATED TO SLDB IN THE NIAH SUAI RDA

			NAME OF BLOCK OF LAND								
			IGANG	GALASAH	SEBANAH	SAWAI	LAMAUS	ENSABANG	JATAN	TELABIT	KABATU
Semi detailed Soil Survey		Year	1973*	1973*	1973*	1973*	1973*	1973*	1973*	1973*	1974-1975
Adjudication by Administrative Officers of boundaries of legal occupation		Year	**	1975	1975	**	1976	1977	1978	1978	**
Survey of boundaries by Land and Survey Department		Year	1974	1975	1975	1976	1976	1977	1978	1978	1975
		Miles	10	16	22	7	21	19	11	13	45
Demarcation of boundaries	Land and Survey Department	Year	1974	1975	1975	1976	1976	1977	1978	1978	1975
		Miles	Nil	9	11	Nil	12	17	6	9	Nil
	Forest Department	Year	1974	1975	1975	1976	1976	1977	1978	1978	1975
		Miles	10	7	11	7	9	2	5	4	45
Salvage	Forest Department Licence No.		T0169	T0102	T0102	T0102	T0102	T0065 T0186	T0169	T0169	FAO Unit 3
Logging	Year of release by Forest Department		1975	1976	1976	1977	1977	1978	1979	1979	1980-1981
Estimated total acreage to be released to agriculture			6 400	5 100	7 600	6 100	8 700	7 750	7 900	5 200	21 500
Commencement of SLDB management		Year	mid-1975	mid-1976	mid-1976	mid-1977	mid-1977	mid-1978	mid-1979	mid-1979	mid-1980 to mid-1981
Period of land clearing by SLDB			mid-1975 to mid-1976	mid-1976 to mid-1977	mid-1976 to mid-1977	mid-1977 to mid-1978	mid-1977 to mid-1979	mid-1978 to mid-1979	mid-1979 to mid-1980	mid-1979 to mid-1981	mid-1980 to mid-1983
Period of planting of perennial crops by SLDB			1976	1977	1977	1978	1978 & 1979	1979	1980	1981 & 1982	1981-1984
Creation of ADU Centre			None	Beginning of 1978	Beginning of 1978	None	Beginning of 1979	Beginning of 1980	None	Beginning of 1982***	Beginning of 1982, 1983 and 1984****
Termination of SLDB management			Does not terminate	end of 1980	end of 1980	Does not terminate	end of 1983	end of 1983	Does not terminate	end of 1985	***

REMARKS AND RECOMMENDATIONS FOR AGRICULTURAL DEVELOPMENT

Name of block of land		Name of block of land	
IGANG	This is the area for which there is a conflict of interests between development needs and the Forest Department. In this programme it is planned to contain the sub-regional service centre and remain in the public estate.	GALASAH	Planned, after full development, to be divided into small-holdings. Road based emprovement along the Miri-Bintulu road planned to start in 1979.
SEBANAH	Planned, after full development, to be divided into small-holdings. Road based improvement southwards to the Suai river planned to start in 1979. 1 225 acres of land south of the SLDB area allocated to private development in 1979. Recommended to be small or medium sized farms.	SAWAI	Planned to be part of the public estate.
LAMAUS	In order to maintain a steady SLDB work programme this sub-scheme is split in two and the development spread accordingly from mid-1977 to mid-1979. After full development the land is planned to be divided into small-holdings. Road based improvement northwards to the Niah river is planned to start in 1980.	ENSABANG	Planned, after full development, to be divided into small-holdings. The occupied land along the western boundary of the planned area offers the opportunity for road based improvement along roads leading westwards. 950 acres of land in the northern part are allocated to private development recommended to be of small and medium sized farms. Such development would be an extension to, and support for, the Sepupok Block Alienation Scheme which has already been started by Government.
JATAN	Planned to be part of the public estate.	TELABIT	The forest here has not yet been exploited at all therefore logging operations should be started as soon as possible. The development of this sub-scheme is spread from mid-1979 to mid-1982. After full development the land is planned to be divided into small holdings. Road based improvement could be taken along roads extending into legally occupied land in the south west.
KABATU	This area is part of the FAO Unit 3 and is planned to be exploited as Phase I in that Unit (see Supporting Report 3 Part I) Forest exploitation is scheduled to start in 1976, which necessitates early completion of soil surveys and boundary demarcation. The development of agricultural land should be based on three villages and subsequently divided into small-holdings. The cropping pattern should be similar to that planned for the other small-holder areas.		

Footnotes:
* Completed by the Consultants
** Not necessary
*** Not planned
**** Not planned, three teams involved

TABLE 6.2 THE PROPOSED SLDB DEVELOPMENT PROGRAMME IN THE NIAH SUAI RDA

Name of Sub scheme	Land clearing (gross acres)					Planting (net acres)				
	Period	For village site	For agriculture	Total	Remarks	Year	Oil palm	Rubber	Cocoa	Total
IGANG	mid-1975 to mid-1976	580	4 015	4 595	whole crop area + sub regional centre	1976	3 245	370	-	3 615
GALASAH	mid-1976 to mid-1977	245	2 810	3 055	whole crop area (180 for rice) + village	1977	1 560	495	315	2 370
SEBANAH		400	4 590	4 990	whole crop area (395 for rice) + village		2 385	920	560	3 865
SAWAI	mid-1977 to mid-1978	Nil	3 930	3 930	whole crop area, no rice and no village	1978	2 620	645	270	3 535
LAMAUS		500	3 770	4 270	village + 360 rice and 570 cocoa land + 2 840 of oil palm land		2 555	-	510	3 065
LAMAUS	mid-1978 to mid-1979	-	2 005	2 005	1 400 rubber + 605 oil palm land	1979	545	1 260	-	1 805
ENSABANG		500	5 625	6 125	whole crop area + village		3 490	1 270	-	4 760
JATAN	mid-1979 to mid-1980	-	7 265	7 265	whole crop area, no rice and no village	1980	5 320	770	450	6 540
TELABIT		-	735	735	oil palm land		660	-	-	660
TELABIT	mid-1980 to mid-1981	400	3 895	4 295	remaining crop area + village	1981	1 795	1 370	160	3 325
KABATU		estimated	estimated	3 705	details to be planned following semi-detailed soil survey		*			
KABATU	mid-1981 to mid-1983	estimated	estimated	17 800	details to be planned following semi-detailed soil survey	1982	*			
						1983	*			

* A minimum of 3 935 net acres must be planted to oil palms in Kabatu during 1981, 1982 and 1983 to make a total of 30 000 net acres required for a 60 ton (ffb) per hour factory in the Niah Suai RDA.

TABLE 6.3 THE EVENTUAL DEVELOPMENT PATTERN BY SUB-SCHEME, TYPE OF FARMING AND CROP ACREAGES

Sub-scheme	Type of farming	Type of small-holding*						Cropped areas (net acres)				
		a	b	c	d	e	Total holdings	Oil palm	Rubber	Cocoa	Rice	Total
		number of holdings										
Galasah	Small-holder	-	99	-	-	63	162	1 560	495	315	160	2 530
Sebanah		153	-	-	-	112	265	2 385	920	560	265	4 130
Lamaus		113	116	-	-	102	331	3 100	1 260	510	330	5 200
Ensabang		-	-	318	-	-	318	3 490	1 270	Nil	300	5 060
Telabit		228	-	-	40	-	268	2 455	1 370	160	180	4 165
Totals for small-holders areas		494	215	318	40	277	1 344	12 990	5 315	1 545	1 235	21 085
Igang	Public estate							3 245	370	Nil	Nil	3 615
Sawai								2 620	645	270	Nil	3 535
Jatan								5 320	770	450	Nil	6 540
Totals for public estate areas								11 185	1 785	720	Nil	13 690
Totals for SLDB developed areas								24 175	7 100	2 265	1 235	34 775

* The crop acreages in each type of small holding are given in Table 1.1

staff build-up and activities of the ADU Centres planned to assist and support the small-holder farmers and undertake road-based improvement are given in Part III. Summaries are given in Table 6.4 and the schedule for private development is given in Table 6.5.

Road-based improvement schemes have been planned to be under-

TABLE 6.4 SUMMARIES OF STAFF BUILD-UP AND ACTIVITIES OF THE ADU CENTRES ASSOCIATED WITH SLDB-DEVELOPED SMALL-HOLDER SCHEMES IN THE NIAH SUAI RDA

CENTRES	Year	Total Staff by Sections					Estimated total number of farmers handled	Estimated total acres of crop handled					Remarks
		Extension	Economic	Credit and Saving	Accounts	Total staff		Oil palm	Rubber	Cocoa	Rice	Pepper and other crops	
GALASAH	1978	6	2	1	1	10	162	Nil	Nil	Nil	160	162	Work confined to small-holder rice and homestead plots.
	1979	7	3	1	1	12	187	Nil	Nil	Nil	160	162	Road based improvement starts; land clearing occurs in addition to small-holder support.
	1980	7	3	1	1	12	197	145	175	35	185	207	Road based improvement continues in addition to small-holder support.
	1981	8	7	3	2	20	222	1 800	775	375	210	232	Road based improvement continues and ADU takes repossibility for all small-holder land.
	1982	8	7	3	2	20	237	1 955	960	410	245	277	Road based improvement completed on first constructed road.
SABANAH	1978	11	4	1	1	17	265	Nil	Nil	Nil	265	265	Work confined to small-holder rice and homestead plots.
	1979	13	6	1	1	21	315	Nil	Nil	Nil	265	265	Road based improvement starts; land clearing occurs in addition to small-holder support.
	1980	13	6	1	1	21	329	285	325	65	320	340	Road based improvement completed on first constructed road in addition to small-holder support.
	1981	14	9	3	2	28	329	2 875	1 480	670	355	395	Road based improvement could be expanded; ADU takes responsibility for all small-holder land.
LAMAUS	1979	11	6	1	1	19	331	Nil	Nil	Nil	330	331	Work confined to small-holder rice and homestead plots.
	1980	12	6	1	1	20	356	Nil	Nil	Nil	330	331	Road based improvement starts; land clearing occurs in addition to small-holder support.
	1981	12	6	1	1	20	363	145	175	35	355	376	Road based improvement completed on first constructed road in addition to small-holder support.
	1982	13	9	3	2	27	363	3 370	1 570	570	405	456	Road based improvement could be expanded; ADU takes responsibility for all small-holder land.
ENSABANG	1980	11	5	1	1	18	318	Nil	Nil	Nil	300	318	Work confined to small-holder rice and homestead plots.
	1981	12	5	1	1	19	334	Nil	Nil	Nil	300	318	Road based improvement starts; land clearing occurs in addition to small-holder support.
	1982	12	5	1	1	19	334	95	105	25	325	343	Road based improvement completed on first constructed road in addition to small-holder support.
	1983	13	8	3	2	26	334	3 585	1 375	25	325	341	Road based improvement could be expanded; ADU takes responsibility for all small-holder land.
TELABIT	1982	11	4	1	1	17	268	Nil	Nil	Nil	180	268	Work confined to small-holder rice and homestead plots.
	1983	11	4	1	1	17	268+	?	?	?	180	268)	Road based improvement could start on road between Telabit and Nyalau but this is not included here.
	1984	11	4	1	1	17	268+					)	
	1985	12	7	3	2	24	268+						ADU takes responsibility for all small-holder land.

TABLE 6.5 PROGRAMME FOR PRIVATE DEVELOPMENT IN THE NIAH-SUAI RDA

Area available for allocation gross acres	Year of operations	Estimated total net acreage of crops planted in years				Remarks
		Oil palm	Rubber	Cocoa	Rice	
Land Adjacent to Sabanah						
1 225	1979	Nil	Nil	Nil	Nil	Farmers take possession and clear land
	1980	257	73	23	13)	Land clearing continues and planting of crops takes place
	1981	257	73	23	13)	
	1982	256	74	24	14)	
	Total	770	220	70	40	
Land Adjacent to Ensabang						
950	1981	Nil	Nil	Nil	Nil	Farmers take possession and clear land
	1982	200	57	18	10)	Land clearing continues and planting of crops takes place
	1983	200	57	18	10)	
	1984	200	56	19	10)	
	Total	600	170	55	20	

TABLE 6.6 SUMMARY OF BUILD-UP OF STAFF AND ACTIVITIES OF THE ADU CENTRE AT BATU NIAH

Year	Total Staff by Sections					Estimated total number of farmers handled	Estimated annual acreage prepared for planting				
	Extension	Economic	Credit and Saving	Accounts	Total staff		Oil palm	Rubber	Cocoa	Rice	Other crops and enterprises
1975	5	2	3	1	11	75	425	495	95	75	115
1976	5	2	3	1	11	105	175	205	45	35	55
1977	10	5	3	2	20	225	675	795	115	125	185
1978	12	6	3	2	23	305	455	525	105	85	125
1979	14	9	3	2	28	370	365	425	85	65	105
1980	14	10	3	2	29	450	455	525	105	85	125
1981	19	11	3	1	35	575	705	825	165	125	195
Total to 1981	19	11	3	2	35	575	3 255	3 795	755	595	905

taken by additional staff attached to the ADU Centres estab- lished in Galasah, Sebanah, Lamaus and Ensabang. These small schemes are seen as extensions of the development taking pl- ace in the sub-units, and should be undertaken jointly by SLDB and the ADU; the access road would be constructed by SLDB while the agricultural extension and support work would be carried out by the ADU.

The private development, which would take place also as a natural extension of the work in the sub-schemes, has been planned for land adjacent to Sebanah and Ensabang. It is re- commended that these areas are allocated as small and medium sized farms.

An ADU Centre has been proposed for establishment at Batu Niah in 1975. This early action is needed to guide and support the farmers in the Sepupok Block Alienation Scheme. In 1977

this Centre would be re-enforced with more staff to begin road-based improvement work along the Miri-Bintulu road and along the existing branch road to Batu Niah and Niah. Semi-detailed soil surveys and maps of the roadside lands during 1975, a total area of about 6 200 acres, would be needed.

In both the block alienation scheme and the road-based scheme the agriculture encouraged should be the same as, and orientated towards, that undertaken by SLDB in the nearby intensive development area. A summary of the staff build-up and activities of this ADU Centre is given in Table 6.6.

CHAPTER 7

THE SEKUDONG RDA

7.1 THE PRESENT SITUATION

General

Huge tracts of this Area are covered by virgin forest and form part of the forest industry complexes planned in FAO Units 1 and 2. There are also large areas of occupied land. In the north the occupation is associated with the Suai river and has extended along the Miri-Bintulu road. In the south the occupation has spread along the Batang Kemena and its tributary the Sungai Labang as well as along the Miri-Bintulu road. There are no towns of significance in the Area.

Population

Rural and semi-urban in the whole area - 5 000.

Communication

The Miri-Bintulu road runs right through the Area. The Sungai Labang is navigable to small river craft a long way upstream from its junction with the Kemena.

Agriculture

The agriculture is predominantly shifting cultivation of hill rice with small, scattered plots of rubber throughout the occupied areas as shown in Figure 7.1.

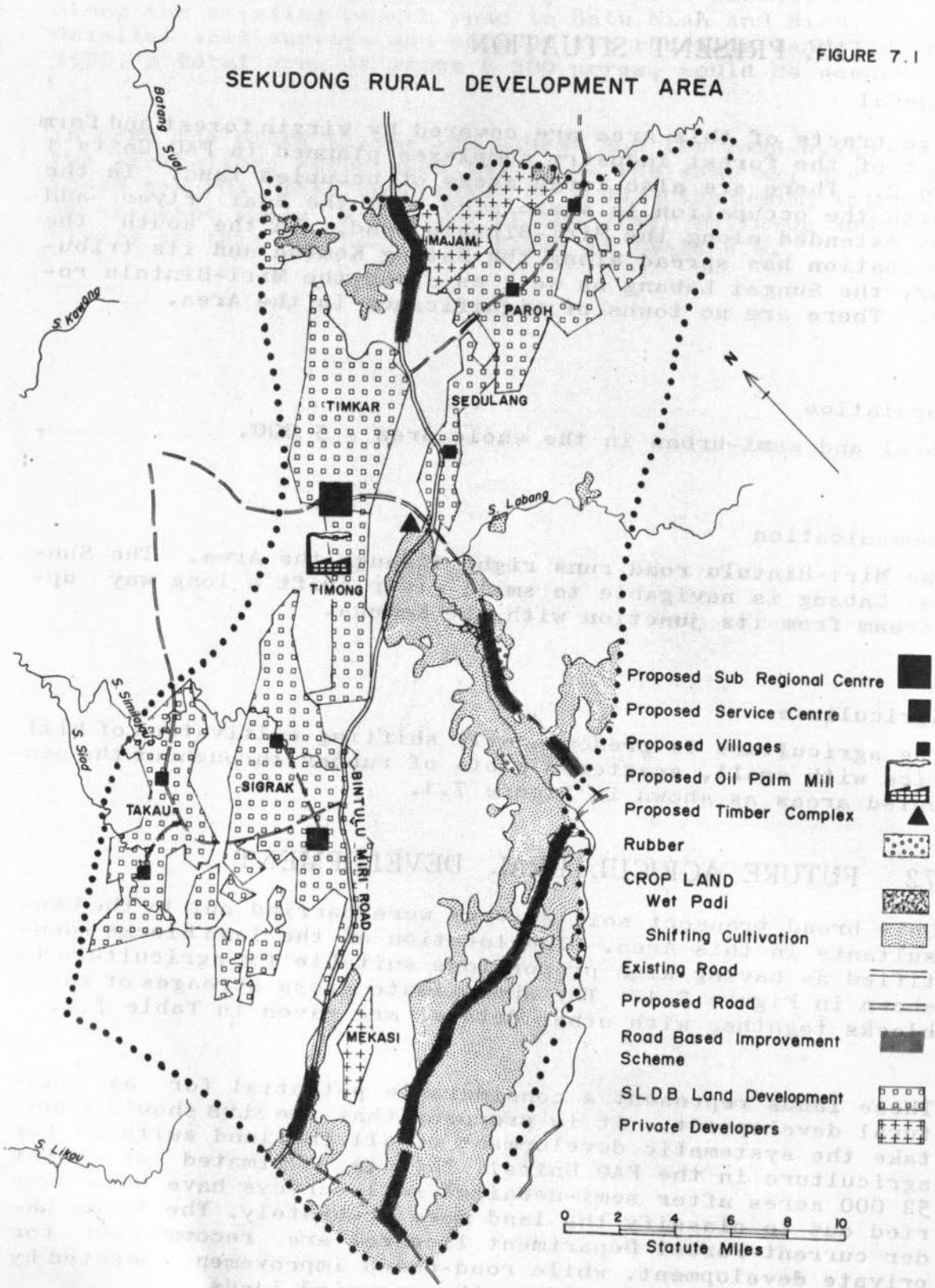
7.2 FUTURE AGRICULTURAL DEVELOPMENT

Only broad transect soil surveys were carried out by the Consultants in this Area. The location of the land blocks identified as having high proportions suitable for agriculture is shown in Figure 7.1. The approximate gross acreages of these blocks together with other detaisl are given in Table 7.1.

These lands represent a considerable potential for agricultural development. It is proposed that the SLDB should undertake the systematic development of all the land suitable for agriculture in the FAO Units. This is estimated at about 52 000 acres after semi-detailed soil surveys have been carried out to classify the land more accurately. The lands under current Forest Department licences are recommended for private development, while road-based improvement operated by the ADU have been planned in the occupied lands.

FIGURE 7.1

SEKUDONG RURAL DEVELOPMENT AREA



Source: Based on 1:250 000 Scale Land Use Map Sheet Number NA 49-4 and The Regional Plan Map No. 22

TABLE 7.1 LAND BLOCKS WITH HIGH PROPORTIONS SUITABLE FOR AGRICULTURE IN THE SEKUDONG RDA

Name of land block	Gross acres				Remarks
	Virgin forest	In licenced forest	Occupied areas	Total	
Timong	5 900	-	-	5 900	In FAO Unit 2 Phase I
Sigrak	18 900	-	-	18 900	In FAO Unit 1 Phase I
Timkar	12 200		6 000	18 200	Virgin forest in FAO Unit 2 Phase I
Sungai Mekasi	900	3 900		4 800	Virgin forest in FAO Unit 1 Phase I. Other forest under Licence No. T0309
Sedulang	4 400			4 400	In FAO Unit 2 Phase I
Paroh	16 700			16 700	In FAO Unit 2 Phase II
Takau	15 900			15 900	In FAO Unit 1 Phase II
Majam		6 700		6 700	Licence No. T0171
Other Occupied			46 700	46 700	
Total	74 900	10 600	52 700	138 200	

TABLE 7.2 THE PROPOSED DEVELOPMENT PROGRAMME FOR LAND ALLOCATED TO SLDB AND PRIVATE DEVELOPERS IN THE SEKUDONG RDA

OPERATION			NAME OF LAND BLOCK SLDB PROGRAMME						PRIVATE DEVELOPER PROGRAMME	
			TIMONG	SIGRAK	TIMKAR	SUNGAI MEKASI	SEDULANG	TAKAU	PAROH	MAJAM	SUNGAI MEKASI
Semi-detailed Soil Survey		Year	1974	1974-1975	1974-1975	1975	1978	1978	1979	1975	1975
		Acres	5 900	18 900	12 200	900	4 400	15 900	16 700	6 700	3 900
Adjudication by Administrative Officers of boundaries of legal occupation		Year	*	*	1975	1975	*	*	*	1975	1975
Survey of boundaries by Land and Survey Department		Year	1975	1975	1975	1975	1978	1979	1980	1975	
		Miles	**	42	44	19	11	28	27	26	
Demarcation of boundaries	Land and Survey Department	Year	*	1975	1975	1975	*	*	*	1975	
		Miles	-	3	4	4	-	-	-	8	
	Forest Department	Year	1975	1975	1975	1975	1978	1979	1980	1975	
		Miles	**	39	40	15	11	28	27	18	
Forest exploitation	Exploiting agency, FAO Unit/Period or Licence		2/I	1/I	2/I	1/I	2/I	1/II	2/II	T0171	T0309
	Year of release by Forest Department		1982	1982	1983	1984	1985	1986	1986	1976	1984
Estimated total acreage to be released to agriculture			4 100	13 200	8 500	600	3 100	11 100	11 700	4 700	2 700
Commencement of SLDB management			Mid-1982	Beginning 1983	Beginning 1984	Beginning 1985	Mid-1985	Mid-1986	Beginning 1986	1977	1984
Estimated clearing schedule		Year	1982/83	1983/84	1984/85	1985/86	1985/86	1986/87	1985/86		
		Acres	2 200	8 100	4 900			1 000	2 700		
		Year	1983/84	1984/85	1985/86			1987/88	1986/87		
		Acres	1 900	5 100	3 600	600	3 100	10 000	9 000		
Estimated planting schedule		Year	1983	1984	1985	1986	1986	1987	1986		
		Acres	2 000	7 300	4 410			900	2 430		
		Year	1984	1985	1986			1988	1987		
		Acres	1 700	4 600	3 240	540	2 800	9 000	8 100		

Footnotes to Table * Not necessary
** Included with Timkar

7.2.1 Recommended SLDB Undertakings

The SLDB operations should start as soon as land clearing has been completed in the Kabatu block of land in the Niah-Suai RDA; that would be to start in early in early 1983. The pattern of development has been assumed to be similar to that proposed in the Niah-Suai RDA and the rate of development assumed to remain constant at about 10 000 acres per year. However, these plans could be modified in accordance with experiences gained from the previous schemes and SLDB's work commitments in other parts of Sarawak. Also new economic, social and political factors could be operating by the early 1980s and may necessitate changes in the planning parameters. The assumed rate and phasing of development is shown in Table 7.2, where it is seen that in several land blocks the semi-detailed soil surveys, boundary surveys and demarcation have been scheduled long before agricultural activities start. This has been necessary to allow orderly forest harvesting to commence in 1976 in the forest industry complexes planned to operate in FAO Units 1 and 2.

Forest harvesting and SLDB activities have been planned to start close to the Miri-Bintulu road and gradually work outwards. The first development would take place in land blocks Timong and Sigrak with the establishment of a public estate and the initiation of a sub-regional centre. Later developments would be northwards and southwards forming satellite small-holder sub-schemes with their associated villages.

From land capability information gained at the broad transect soil survey level and presented in Supporting Report No. 1 Part II, it is reasonable to assume that, if desirable, the cropping pattern proposed for the Niah-Suai RDA could be repeated here. Assuming this to be true, the approximate acreages of the crops would be:-

Oil palms	33 000 acres
Rubber	9 400 acres
Cocoa	3 000 acres
Rice	1 600 acres

These acreages allow for a 10 per cent loss of land due to towns, villages roads and small areas of unsuitable land.

It is envisaged that large centralised processing and marketing facilities would be set up by SLDB for oil palm and rubber. These would also handle produce from outside the SLDB developed areas. Cocoa fermentation and drying plants would be established but they would probably be located at strategic places close to the cocoa growing areas.

7.2.2 Recommended Private Development

Private development is proposed in the Majam and Sungai Mekasi blocks of land, the former being adjacent to land proposed for similar development in the southern part of the Niah-Suai

RDA. The land is easily accessible to the Miri-Bintulu road and the timber is already being harvested. The proposal is that this block should be opened for private, medium-sized farms soon after SLDB has started operations in the Igang sub-scheme in the Niah-Suai RDA. The estimated amount of land that would be found suitable for agriculture, following a semi-detailed soil survey, is 4 700 acres. The major crop planted here should be oil palms and during the early years the sale of fresh fruit bunches would be to the mill near Igang. Later, about 1986, when a mill would be established in the Sekudong RDA, the marketing arrangements could be diverted to the new mill.

The Sungai Mekasi block (3 900 acres gross; estimated 2 700 net acres after semi-detailed soil survey) would have to be opened for development later because its agriculture should be directly associated with, and similar to that undertaken by, SLDB in the Timong and Sigrak blocks. Thus the opening of Mekasi is not recommended until about mid 1984 although it is easily accessible to the Miri-Bintulu road. It should be considered for small-sized farms. For calculation purposes it has been assumed to take three years before clearing for agriculture would be complete. The suggested schedules of activities for both the Majam and Sungai Mekasi blocks are given in Table 7.2.

7.2.3 Road-Based Improvement

A road linking the existing settlements of Labang and Tubau to the Miri-Bintulu road has been recommended for early construction (see Supporting Reports Nos. 5 and 7). Starting in 1975 the road would be completed to Labang by 1976. An ADU Centre has been scheduled to be formed in Labang in 1977 to undertake road-based improvement along the section of the road between Labang and the Miri-Bintulu road. Details of the build-up of the team and its activities are given in Part III and summarised in Table 7.3. Oil palm has not been recommended for inclusion in the cropping pattern because to

TABLE 7.3 SUMMARY OF STAFF BUILD-UP AND ACTIVITIES OF THE ADU CENTRE AT LABANG FOR ROAD BASED IMPROVEMENT IN THE SEKUDONG RDA UP TO 1981

Year	Total Staff by Sections					Estimated total number of farmers handled	Estimated annual acreage prepared for planting			
	Extension	Economic	Credit and Saving	Accounts	Total staff		Rubber	Cocoa	Rice	Pepper and other crops
1977	5	2	1	1	9	75	855	95	95	165
1978	5	2	1	1	9	105	345	45	45	75
1979	5	3	1	1	10	150	505	65	65	105
1980	6	7	1	1	15	175	275	35	35	55
1981	6	7	1	2	16	185	135	15	15	25
Total by 1981	6	7	1	2	16	185	2 115	255	255	425

plant the crop as early as 1977 in this area would require processing facilities for the ffb by about 1981. In the SLDB scheduled programme (Table 7.2) no palm oil factory would be likely to be built until about 1986. Thus the road-based improvement effort should rely for its base on the activities being undertaken in the Beseduan land block in the Labang-Tubau RDA (see Chapter 8). The main crop for the road-based schemes is expected to be rubber as is shown in Table 7.3. However, along roads extending into occupied land south-west of Labang, and scheduled for construction in 1981 and 1982, the road-based improvement of agriculture should be associated with the development planned to be undertaken by SLDB in Timong and Sigrak. The main crop here is expected to be oil palms and the ADU staff at the Labang Centre would need to be increased to guide and support this work.

CHAPTER 8
THE LABANG - TUBAU RDA

8.1 THE PRESENT SITUATION

General

This Area consists of land associated with the middle and upper reaches of the Batang Kemena and its tributaries. Large blocks of land are occupied, especially along the rivers. The virgin forest in the north is included in FAO Unit 2. The unoccupied forest land in the centre of the Area is currently being harvested under Government licence.

The three settlements of any size, Labang, Tubau and Pandan, are typical small riverside bazaar towns.

Population

Rural and semi-urban in the whole Area - 8 500.

Communications

The river system forms the only lines of communications. Trading launches are able to reach Tubau on the Batang Kemena and a considerable distance up the Pandan tributary.

Agriculture

It is practically all cultivation of hill rice with small patches of rubber scattered throughout, as shown in Figure 8.1.

8.2 FUTURE AGRICULTURAL DEVELOPMENT

Only schematic and broad transect investigations were carried out by the Consultants in this Area (see Supporting Report No. 1 Part II). The approximate acreages of different categories of agricultural land identified at the two levels are given in Table 8.1.

Semi-detailed soil surveys will be necessary in all the areas to identify accurately the land suitable for agriculture. The estimated acreages of such land that will be found are:-

- occupied land 52 000 acres (reductions of 30 per cent in the case of land assessed at the broad transect level and 55 per cent in the case of land from the schematic investigations);

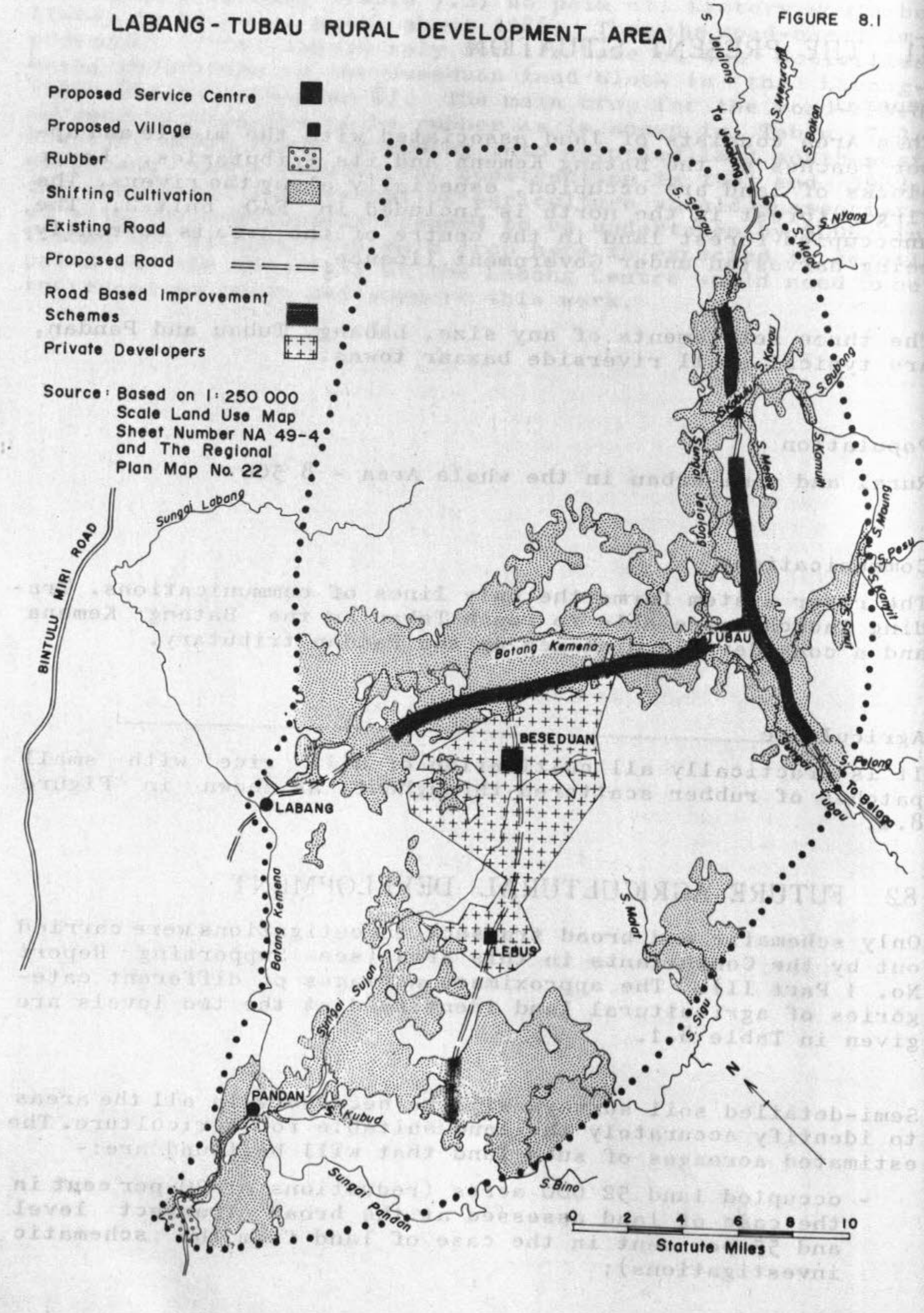

LABANG - TUBAU RURAL DEVELOPMENT AREA
FIGURE 8.1
Proposed Service Centre
Proposed Village
Rubber
Shifting Cultivation
Existing Road
Proposed Road
Road Based Improvement Schemes
Private Developers
Source: Based on 1:250 000 Scale Land Use Map Sheet Number NA 49-4 and The Regional Plan Map No. 22
BINTULU MIRI ROAD
Sungai Labang
Batang Kemena
Sungai Sujan
S. Kubud
Sungai Pandan
S. Bino
S. Sigu
S. Malat
LABANG
BESEDUAN
LEBUS
PANDAN
TUBAU
Sungai Jelalong
S. Jelalong
To Jelalong
S. Menyong
S. Bokan
S. Sebrau
S. Nyang
S. Kavau
S. Bubong
S. Melau
S. Kamum
S. Maung
S. Pesu
S. Kamyit
S. Sinut
S. Pelong
Sungai Tubau
To Belaga
N
0 2 4 6 8 10
Statute Miles

TABLE 8.1 ESTIMATED ACREAGES OF DIFFERENT CATEGORIES OF LAND WITH AGRICULTURAL POTENTIAL IDENTIFIED AT TWO LEVELS OF SURVEY IN THE LABANG-TUBAU RDA

Level of investigation	Occupied land	Unoccupied land	
		Forest under current exploitation and outside existing Forest Reserves	Virgin forest within existing Reserves
Broad transect soil survey (high percentage suitable for agriculture)	57 000	23 000	-
Schematic reconnaissance investigations (possibly suitable for agriculture)	27 000	-	8 000

- unoccupied forest land outside existing Forest Reserves, 16 000 acres;
- virgin forest land within existing Forest Reserves, 3 600 acres.

Early creation of a nucleus development within these lands would be necessary to give a base from which to assist the considerable existing population in the occupied areas. But large scale agricultural activities could not start until the proposed new road from the Bintulu-Miri road through Labang to Tubau has been completed. This has been scheduled for 1977 (see Supporting Reports Nos. 5 and 7) and large scale agricultural activities could start in that year. However, the creation of the nucleus has not been planned to be undertaken by SLDB because that organisation would be fully committed in the Niah-Suai and Sekudong RDAs right up to 1987. Therefore, the proposal has been made that development in Labang-Tubau RDA should be initiated by private enterprise located in the land blocks named Beseduan and Lebus which are unoccupied lands outside existing Forest Reserves. The blocks of potential agricultural land within the Forest Reserves have not been included in the present plans because the possible development of the land is too far in the future and they are too inaccessible and isolated.

8.2.1 Recommended Private Development

The Beseduan block is recommended for allocation as one, or at the most two, large estates which would be required to create the nucleus on which development in the surrounding land could be based. The Lebus block should be reserved for medium-sized private farms, which would rely on the processing and marketing facilities provided by the nucleus estate.

It is difficult to recommend a specific type of farming or

cropping pattern for these lands without the information that would be provided by a semi-detailed soil survey. However, some ideas can be given.

The amount of land available has been considered insufficient to support an oil palm mill if diversified cropping is practised. Therefore, the land would more appropriately be developed to a combination of other crops and enterprises which would not require so large a planted acreage to support them: for example, rubber, cocoa, robusta coffee and beef cattle. Rubber in particular appears attractive because Government has plans to build a crumb rubber factory at Bintulu. A schedule of activities to develop the Beseduan and Lebus land is given in Table 8.2.

TABLE 8.2 PROPOSED SCHEDULE OF ACTIVITIES LEADING TO RELEASE OF LAND FOR PRIVATE ENTERPRISE IN THE LABANG-TUBAU RDA

			BESEDUAN	LEBUS
Semi-detailed Soil Survey		Year	1975	1975
		Acres	18 800	4 100
Adjudication by Administrative Officers of boundaries of legal occupation		Year	1975	1975
Survey of boundaries by Land and Survey Department		Year	1975	1975
		Miles	26	13
Demarcation of boundaries	Land and Survey Department	Year	1975	1975
		Miles	12	4
	Forest Department	Year	1975	1975
		Miles	14	9
Estimated acreage to be released for agriculture			13 100	2 600
Allocation schedule for year			1979	1980

8.2.2 Road-Based Improvement

An ADU Centre planned to be formed at Labang in 1977 has been discussed in Chapter 7. A second Centre has been planned to be established in Tubau during 1978 to carry out road-based improvement work along the new road between Labang and Tubau. The agricultural enterprises recommended and supported should be the same as those on the nucleus estate. For calculation purposes it has been assumed that rubber would be the main crop. The build-up of staff and activities of the ADU Centre are given in detail in Part III and summarised in Table 8.3.

During 1984, 1985 and 1986 feeder roads have been planned for construction through the occupied lands south and north of Tubau (see Supporting Reports Nos. 5 and 7). The southern road would extend to Belaga in the Third Division while the northern road would first extend to Jelalong and later, perhaps after 1990, to Long Jegan. These roads would provide the opportunity to carry out road-based improvement into large

areas of occupied land. The ADU staff in the Tubau Centre would need to be considerably increased for this work.

TABLE 8.3 SUMMARY OF STAFF BUILD-UP AND ACTIVITIES OF THE ADU CENTRE AT TUBAU FOR ROAD BASED IMPROVEMENT IN THE LABANG-TUBAU RDA

Year	Total Staff by Sections					Estimated total number of farmers handled	Estimated annual acreage prepared for planting			
	Estension	Economic	Credit and Saving	Accounts	Total staff		Rubber	Cocoa	Rice	Other crops and enterprises
1978	5	2	1	1	9	75	855	95	95	165
1979	5	2	1	1	9	105	345	45	45	75
1980	5	4	1	1	11	150	505	65	65	105
1981	7	7	1	2	17	200	565	65	65	115
Total up to 1981	7	7	1	1	17	200	2 270	270	270	460

CHAPTER 9

THE NYALAU RDA

9.1 THE PRESENT SITUATION

General

The majority of the Area is virgin forest which has been included in the harvesting plans of the forest industry complexes operating in FAO Units 1 and 2.

Occupied land only occurs in the north along the Batang Suai and in the west around the Sungai Nyalau, Sungai Perihas and Sungai Similajau.

There are no existing towns in the Area.

Population

Rural and semi-urban in the whole Area - 3 500.

Communications

There are no existing roads, but the Batang Suai is navigable by trading launches, probably for its whole length along the northern boundary of the Area. Small river craft are used on the Nyalau, Perihas and Similajau rivers.

Agriculture

In the occupied areas the agriculture is predominantly shift-cultivation of hill rice.

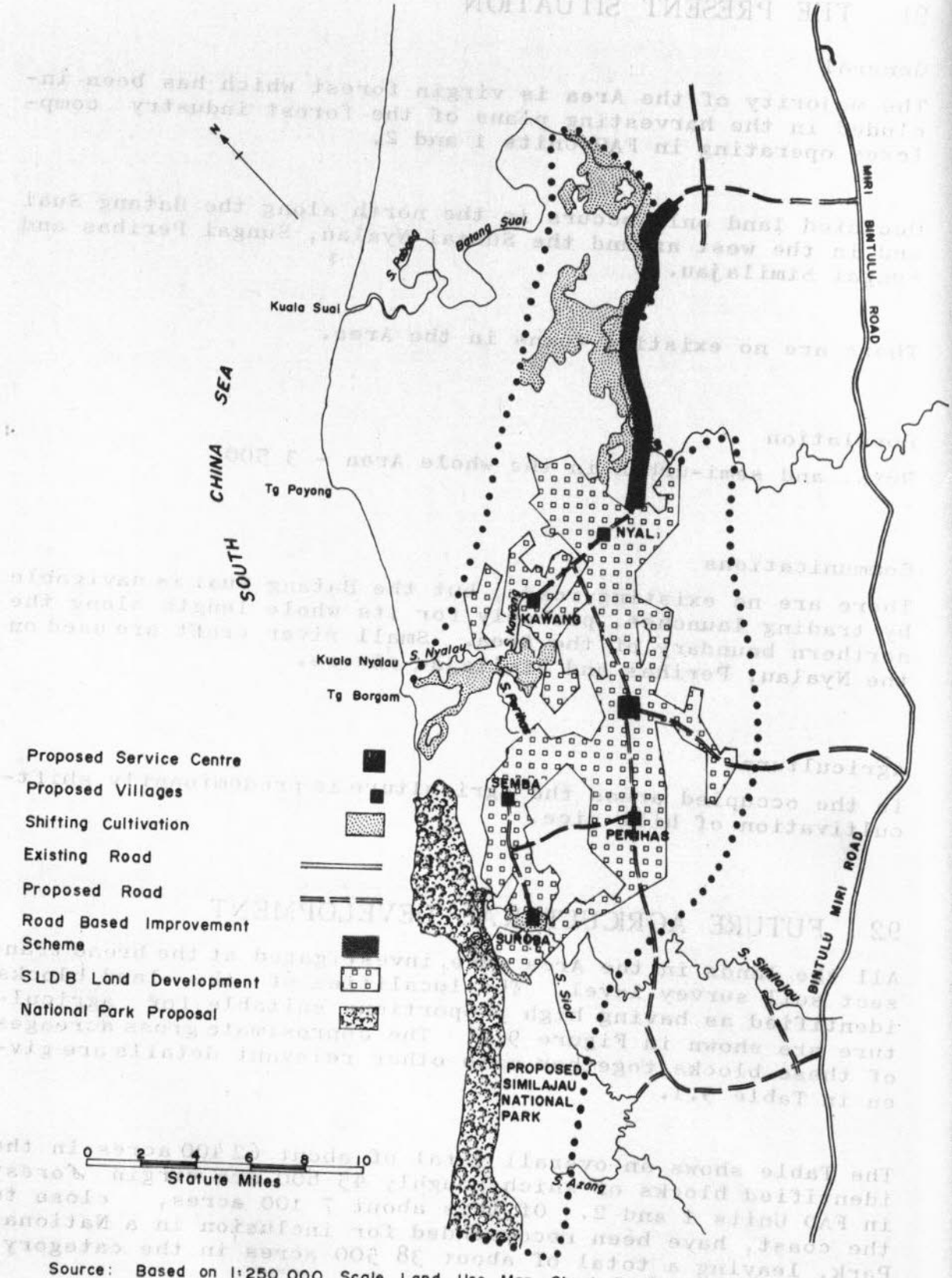
9.2 FUTURE AGRICULTURAL DEVELOPMENT

All the lands in the Area were investigated at the broad transect soil survey level. The localities of the land blocks identified as having high proportions suitable for agriculture are shown in Figure 9.1. The approximate gross acreages of these blocks together with other relevant details are given in Table 9.1.

The Table shows an overall total of about 62 400 acres in the identified blocks of which roughly 45 600 are virgin forest in FAO Units 1 and 2. Of this about 7 100 acres, close to the coast, have been recommended for inclusion in a National Park, leaving a total of about 38 500 acres in the category.

FIGURE 9.1

NYALAU RURAL DEVELOPMENT AREA



Source: Based on 1:250 000 Scale Land Use Map Sheet Number NA 49-4 and The Regional Plan Map No. 22

TABLE 9.1 LAND BLOCKS WITH HIGH PROPORTIONS SUITABLE FOR AGRICULTURE IN THE NYALAU RDA

Name of land block	Gross acres				Remarks
	Virgin forest areas	Licenced forest areas	Occupied areas	Total	
NYAL	12 000	4 400	7 000	23 400	Virgin forest in FAO Unit Phase II Licenced forest under licence No. T0093
KAWANG	3 300	Nil	5 400	8 700	Virgin forest in FAO Unit 2 Phase II
PERIHAS	10 300	Nil	Nil	10 300	Virgin forest in FAO Unit 2 Phase III
SEMBA	6 200	Nil	Nil	6 200	Virgin forest in FAO Unit 2 Phase III
TANJONG SIMILAJAU	4 100	Nil	Nil	4 100	Virgin forest in FAO Unit 2 Phase III but all of it is included in an area forming part of a recommended Similajau National Park. (See Supporting Report 3 Part II).
SUROBA	9 700	Nil	Nil	9 700	Virgin forest in FAO Unit 1 Phase III 3 000 acres are included in the area recommended for the National Park previously mentioned.
TOTALS	45 600	4 400	12 400	62 400	

Development of all lands has been envisaged as a natural extension and continuation of development in the Sekudong RDA. It has been assumed, for calculation purposes, that all the unoccupied lands would be developed by SLDB while the ADU would carry out road-based improvement in the occupied lands.

Semi-detailed soil surveys would be necessary to determine exactly the boundaries of the suitable agricultural lands. The total acreages of such land have been estimated at:-

- unoccupied forest land - 30 000
- occupied land - 8 680

9.2.1 Development by SLDB

The pattern of development foreseen would be the same as the Niah-Suai and Sekudong RDAs, whereby SLDB would create a public estate to initiate a sub-regional centre with mutually supporting small-holder villages around it.

The cropping pattern would follow and supplement, if necessary, that in Sekudong. Assuming the cropping pattern would be similar, then the estimated acreages of different crops would be:-

- oil palms - 21 000 acres
- rubber - 6 000 acres
- cocoa - 2 000 acres
- rice - 1 000 acres

These estimates allow for a 10 per cent loss of land due to towns, villages, roads and small areas of unsuitable land.

Agricultural activities would have to be co-ordinated with the orderly harvesting of the forests by the operators of FAO

Units 1 and 2 and the holder of licence No. T0093. Arrangements for this are given in detail in Supporting Report No. 3 Part I and summarised in Table 9.2.

TABLE 9.2 ASSUMED DEVELOPMENT PROGRAMME IN THE NYALAU RDA

OPERATION			NAME OF LAND BLOCK				
			NYAL	KAWANG	PERIHAS	SEMBA	SUROBA
Semi-detailed Soil Survey		Year	1979	1980	1981	1981	1981
		Acres	16 400(1)	3 300(2)	10 300	6 200	6 700
Adjudication by Administrative Officers of boundaries of legal occupation		Year	1980	1980	*	*	*
Survey of boundaries by Land and Survey Department		Year	1980	1980	1981	1982	1982
		Miles	44	37	21	32	30
Demarcation of boundaries	Land and Survey Department	Year	1980	1980	-	-	-
		Miles	9	8	Nil	Nil	Nil
	Forest Department	Year	1980	1980	1981	1982	1982
		Miles	35	29	21	32	30
Forest exploitation	FAO Unit/Period, or Licence Number		2/II T0093	2/II	2/III	2/III	2/III
	Year of release by Forest Department		1987	1989	1988	1989	1989
Estimated total acreage to be released to agriculture			8 400 and 3 100	2 300	7 200	4 400	4 700
Commencement of SLDB management			Beginning 1988	Mid-1989	Mid-1989	Mid-1989	Mid-1989
Estimated clearing schedule		Year	1988/89	1989/90	1989/90	1990/91	1990/91
		Acres	8 400	2 300	6 200	4 400	4 700
		Year	1988/89		1990/91		
		Acres	1 600		1 000		
		Year	1989/90				
		Acres	1 500				
Estimated planting schedule		Year	1989	1990	1990	1991	1991
		Acres	7 560	2 070	5 580	3 960	4 230
		Year	1989		1991		
		Acres	1 440		900		
		Year	1990				
		Acres	1 350				

Notes (1) excludes 7 000 acres of occupied land.) Soil surveys in these areas are only required where road based
(2) excludes 5 400 acres of occupied land.) improvement is to be undertaken.
* Not necessary.

9.2.2 Road - Based Improvement

This could not commence until after development has started in the Nyal land block and after a road, extending south-westwards from the Telabit sub-scheme in the Niah-Suai RDA to Nyal, has been completed. Construction of the road has been scheduled to commence in 1982 and be completed in 1983.

CHAPTER 10

THE BINTULU RDA

10.1 THE PRESENT SITUATION

General

Bintulu town has become established as a natural result of the trading activities associated with timber and other products produced in the catchment areas of the Batang Kemena and its tributaries. The town is a Government District headquarters with a trading bazaar and several small industries, including sawmills and a sago mill. Sebauh is a small riverside bazaar town.

Arrangements are well advanced for the construction of a very large liquified natural gas (LNG) plant at Tanjong Kidurong. A feasibility study has started to investigate the possibilities for a deep water port near Bintulu, and, the construction of a jetty in the bay to handle timber exports is already planned. The jetty, and later the port, if it is built, would be the outlet for most of the agricultural products of the Study Area and the timber products from the forest industry complexes operating in FAO Units 1, 2 and 3. However, the forests in the Bintulu RDA itself are not extensive and have either been already exploited or are currently being exploited.

Population (1970)

Urban (Bintulu) - 6 000;
Rural and semi-urban in the remaining parts - 6 000.

Communications

The all-weather road runs northwards to Miri some 130 miles away. Bintulu is a scheduled stop for the Malaysian Airline System's internal flights.

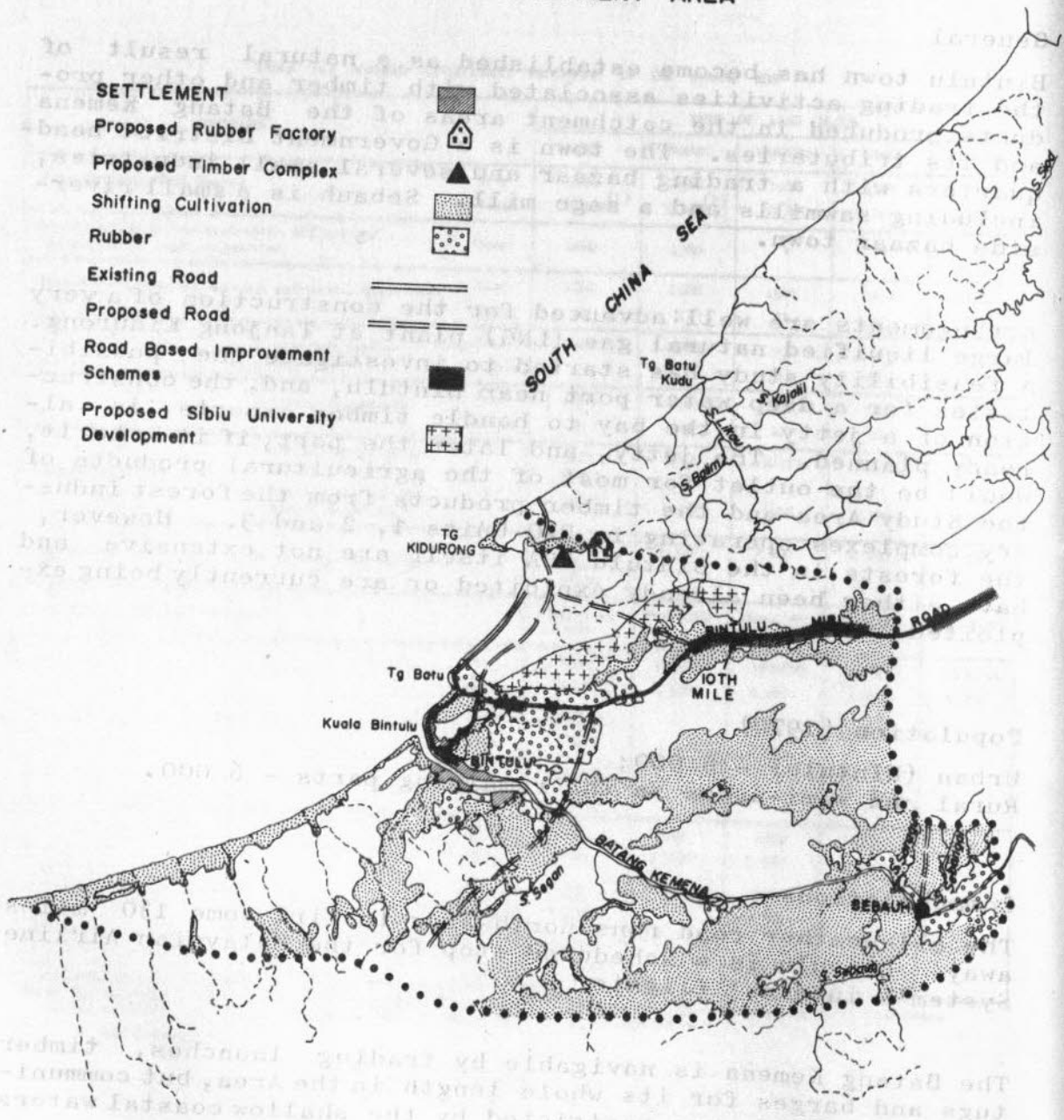
The Batang Kemena is navigable by trading launches, timber tugs and barges for its whole length in the Area, but communications seawards are restricted by the shallow coastal waters and a sand bar at the river mouth.

Agriculture

Important features are the concentration of rubber plantings close to Bintulu and around Sebauh as shown in Figure 10.1. Government has plans to establish a crumb rubber factory in Bintulu to handle the potential rubber production from these

BINTULU RURAL DEVELOPMENT AREA

FIGURE 10.1



Source: Based On 1:250 000 Scale Land Use Map Sheet Number NA 49-4 and The Regional Plan Map No. 22

0 2 4 6 8 10

Statute Miles

plantations as well as from the numerous scattered plots throughout the river catchment area. On the coast south of Bintulu, there are coconut plantations where cattle rearing as a supplementary enterprise is practised. Much of the remaining occupied land is under shifting cultivation of hill rice, although there is some market gardening close to Bintulu and, in the riverside swamps, some wet rice is grown and some exploitation of sago palms is undertaken. The rubber plantations near Bintulu are mostly old and will probably complete their economic life within five to ten years.

10.2 FUTURE AGRICULTURAL DEVELOPMENT

The broad transect soil survey identified about 17 800 acres of occupied land and 3 000 acres of unoccupied forest land as having high proportions of land suitable for agriculture. Much of the occupied land is around Bintulu town and along the Miri-Bintulu road.

To guide and support improved agriculture in the occupied land an ADU Centre has been planned to be formed in 1976 at a Department of Agriculture Station about 10 miles from Bintulu on the road to Miri. The agricultural activities of the ADU should be concerned mainly with increasing the acreage of rubber along the main road to support the future factory, and with market gardening, the raising of pigs and poultry and pond culture of fish. All the latter enterprises should be aimed at supplying the market created by the expected rapid increase of population (15 000 by 1980 and 40 000 by 1990) associated with the LNG-plant and port construction activities at Tanjong Kidurong. The details of the expected build-up of the staff and activities of the ADU Centre are given in Part III and are summarised in Table 10.1.

TABLE 10.1 SUMMARISED BUILD-UP OF STAFF AND ACTIVITIES OF THE ADU CENTRE IN THE BINTULU RDA

Year	Total Staff by Sections					Estimated total number of farmers handled	Estimated annual acreage prepared for planting			
	Extension	Economic	Credit and Saving	Accounts	Total staff		Rubber	Cocoa	Rice	Other crops and enterprises
1976	5	2	1	1	9	75	855	95	95	165
1977	5	2	1	1	9	105	345	45	45	75
1978	5	4	1	1	11	150	505	65	65	105
1979	6	5	1	1	13	175	275	35	35	55
1980	6	7	1	2	16	185	135	15	15	25
1981	6	7	1	2	16	200	165	25	25	35
Total up to 1981	6	7	1	2	16	200	2 280	280	280	460

The 3 000 acres of unoccupied forest land (Sibiu block) would be allocated as a farm and possible campus site for the agricultural university, which Government plans to establish in the vicinity of Bintulu. The programme of activities for the

release of this land is given in Table 10.2.

TABLE 10.2 PROPOSED PROGRAMME OF ACTIVITIES FOR THE RELEASE OF SIBIU FOR A UNIVERSITY FARM

Semi-detailed Soil Survey		Year Acres	1974 3 300
Adjudication by Administrative Officers of boundaries of legal occupation		Year	1974
Survey of boundaries by Land and Survey Department		Year Miles	1974 23
Demarcation of boundaries	Land and Survey Department	Year Miles	1974 11
	Forest Department	Year Miles	1974 12
Forest exploitation	Exploiting agency FAO Unit/Period or licence Year of release by Forest Department		1/I, TO309, TO117 1976
Estimated total acreage to be released to University			2 300

CHAPTER 11

SUMMARIES OF AGRICULTURAL DEVELOPMENT

In this chapter the numerous activities described in the previous chapters are summarised in Tables showing the work planned to be undertaken by the various agencies over the whole Study Area from the present (1974) up to 1990. The years 1974 to mid 1981 have been planned in greater detail than later years. This is required by the Terms of Reference for the Study and the more detailed information covers the agricultural plan for the Action Programme.

The combining and integration, within each RDA, of forest harvesting and agricultural development with all other activities necessary to create a modern society is explained in Supporting Report No. 5. Detailed forest harvesting schedules are given in Supporting Report No. 3 Part I.

11.1 THE ROLE OF THE SLDB

The SLDB has been planned to develop State Land in four RDAs; Lambir-Subis, Niah-Suai, Sekudong and Nyalau. The proposed overall clearing programme is given in Table 11.1 which shows that the scale of operations has been planned to be less in the future than in the past. This is because the Sarawak Government intends that SLDB should start operating on a larger scale in other parts of the State. The planned clearing pro-

TABLE 11.1 PRESENT AND PROPOSED FUTURE RATE OF LAND CLEARING BY SLDB

Period of clearing	Rural Development Areas						Total	Remarks
	Lambir Subis			Niah Suai	Sekudong	Nyalau		
	Original Lambir Subis Development Area	Mera-a	Karabungan					
1973 - 1974	16 200		750				16 950	Activities already started and nearly complete.
1974 - 1975	500	3 705	3 000				7 205	Clearing in Karabungan undertaken for NLC and Agricultural Department.
1975 - 1976			2 000	4 595			6 595	
1976 - 1977			1 000	8 045			9 045	
1977 - 1978				8 200			8 200	
1978 - 1979				8 130			8 130	
1979 - 1980				8 000			8 000	
1980 - 1981				8 000			8 000	
1981 - 1982				10 000			10 000	
1982 - 1983				7 800	2 200		10 000	
1983 - 1984					10 000		10 000	
1984 - 1985					10 000		10 000	
1985 - 1986					10 000		10 000	
1986 - 1987					10 000		10 000	
1987 - 1988						10 000	10 000	
1988 - 1989						10 000	10 000	
1989 - 1990						10 100	10 100	
1990 - 1991								
Total not including 1973 - 1974	500	3 705	6 000	62 770	52 200	30 100	155 275	

gramme for 1974/75 is about 7 000 acres; less than half the previous year, but thereafter there would be a gradual increase over time, first to about 8 000 acres and then to 10 000 acres per year. The land to be cleared in Karabungan between 1974 and 1977 has been planned for the establishment of the NLC beef cattle ranch and the adjacent Livestock Production and Animal Husbandry Training Centre. The 500 acres within the original Lambir-Subis Development Area has been planned by SLDB for planting its first large area of cocoa.

TABLE 11.2 PRESENT AND PROPOSED FUTURE PLANTING PROGRAMME FOR SLDB OF PERMANENT CROPS

Year	(Approximate net planted acres)				Rural Development Area	Remarks
	Oil palm	Rubber	Cocoa	Total acres		
1974	14 100	Nil	500	14 600	Lambir Subis	Already planned by SLDB.
1975	1 890	875	120	2 885	Lambir Subis	Mera-a sub-scheme; for eventual allocation to small-holders.
1976	3 245	370	Nil	3 615	Niah - Suai	Central area of public estate; includes sub-regional service centre.
1977	3 945	1 415	875	6 235	Niah - Suai	Sub-schemes for eventual allocation to small-holders (Galasah and Sebanah).
1978	5 175	645	780	6 600	Niah - Suai	Part of the public estate and part of a small-holder sub-scheme (Lamaus).
1979	4 035	2 530	Nil	6 565	Niah - Suai	Small-holder sub-schemes (Lamaus and Ensabang).
1980	5 980	770	450	7 200	Niah - Suai	Part of the public estate and part of a small-holder sub-scheme (Telabit).
up to mid-1981	1 795	1 370	160	3 325	Niah - Suai	Completion of a small-holder sub-scheme (Telabit).
Total 1975 to mid-1981	26 065	7 975	2 385	36 425		In addition about 4 340 acres would be cleared for a town, villages and rice or remain waste land.
mid-1981	Detailed planning not undertaken. Estimates based on assumption that settlement and cropping patterns would be similar to those planned for the previous period.			3 175	Niah - Suai	Semi-detailed soil surveys are required for all these areas.
1982				8 100	Niah - Suai	
1983				8 100	Niah-Suai and Sekudong	
1984				8 100	Sekudong	
1985				8 100	Sekudong	
1986				8 100	Sekudong	
1987				8 100	Sekudong	
1988				8 100	Sekudong	
1989				8 100	Nyalau	
1990				8 100	Nyalau	
1991				8 200	Nyalau	
Estimated totals mid-1981 to 1991	62 200	16 130	5 940	84 275		In addition about 9 020 acres would be cleared for towns, villages and rice or remain waste land.
Estimated totals 1975 to 1991	88 270	24 105	8 325	120 700		In addition about 12 360 acres would be cleared for towns, villages and rice or remain waste land.

The proposed permanent crop planting programme is given in Table 11.2. A gradual increase in total acreage planted would occur over the plan period; starting at roughly 3 000 acres in 1975 and reaching a maximum of about 8 000 acres in 1982. In addition SLDB would be expected to raise the oil palm and cocoa seedlings for plantings in the road-based improvement schemes and small scale private farmers. Estimates of the number of seedlings needed each year would be provided by the ADU.

The number of potential small-holder farmers needed to fulfil the SLDB development programme up to 1981 is shown in Table 11.3 which also indicates the planned number of each type of small-holding.

TABLE 11.3 THE NUMBER OF POTENTIAL SMALL-HOLDERS REQUIRED UP-TO MID 1981 AND TYPES OF HOLDINGS PLANNED

Period	Number of potential small-holders required	Number of different types of holdings planned*				
		Type a	Type b	Type c	Type d	Type e
1975	194	50	115	Nil	29	Nil
1976	Nil	Nil	Nil	Nil	Nil	Nil
1977	427	153	99	Nil	Nil	175
1978 and 1979	649	113	116	318	Nil	102
1980 and 1981	268	228	Nil	Nil	40	Nil
Totals	1 538	544	330	318	69	277

* The crop acreages comprising each holding type have been given in Table 1.1.

TABLE 11.4 THE TOTAL ACREAGES OF PERMANENT CROPS UNDER DIRECT SLDB CONTROL

Year	Estimated total acreages of crops under SLDB control				Remarks	
	Oil palm	Rubber	Cocoa	Total crops		
1974	27 600	3 000	500	31 100	Acreages already under SLDB control	Acreages are planned
1975	29 490	3 675	620	33 985		
1976	32 735	4 245	620	37 600		
1977	36 680	5 660	1 495	43 835		
1978	41 855	6 305	2 275	50 435		
1979	44 000	7 960	2 155	54 115	The Mera-a sub-scheme taken over by small-holders	
1980	49 980	8 730	2 315	61 025		
1981	50 780	8 615	1 895	61 290	Galasah and Sebanah sub-schemes taken over by small-holders	Acreages are estimated
1982	53 595	8 975	1 950	64 520	Lamaus sub-scheme taken over by small-holders	
1983	56 015	9 325	2 520	67 860	Ensabang sub-scheme taken over by small-holders	
1984	61 930	10 945	3 090	75 965		
1985	65 390	11 195	3 495	80 080	Telabit sub-scheme taken over by small-holders	

Table 11.4 shows the acreage of crops that would remain under direct SLDB control, assuming that SLDB management would cease on small-holder sub-schemes about five years after clearing the land. The Table continues only up to 1985, the time when SLDB management would cease on the last small-holder sub-scheme started during the Action Programme period. Nevertheless there would be a steady increase in acreages of oil palm, rubber and cocoa.

The SLDB organisation and management staff requirements for the proposed programme, in addition to the present staff, are detailed in Part III and summarised in Table 11.5. Employment that would be created in addition to the settlement of small-holders is discussed in Chapter 12.

TABLE 11.5 SUMMARY OF ESTIMATED ADDITIONAL SLDB FIELD MANAGEMENT STAFF REQUIRED FOR THE DEVELOPMENT PROPOSED UP TO 1980

Staff cadre	Number of new staff required in each year						
	1975	1976	1977	1978	1979	1980	1981→
Scheme Managers	1	1	2	1	0	1	Estimates here would not be meaningful because the development has not been planned in detail
Assistant Managers	1	2	3	2	4	2	
Field Supervisors	3	3	8	8	7	2	
Field Assistants	5	6	12	10	21	3	

11.2 THE ROLE OF THE DEPARTMENT OF AGRICULTURE

This Department would have four main spheres of activity:-

- the ADU, working in the intensive development areas;
- the existing extension service, continuing its work in the remainder of Fourth Division;
- the research service, continuing and expanding, but orientated to investigate aspects of particular relevance to the planned development;
- the Soil Survey Branch, carrying out semi-detailed soil surveys and land use mapping of areas for agricultural development. For convenience discussion of this task is included with other related surveys in Section 11.4.

11.2.1 The ADU

The establishment of ADU Centres could not start on a large scale until the necessary staff have been trained. In Supporting Report No. 2, Part III, a training programme has been recommended which envisages the taking over of an existing Farmers Training Institute at Kabuloh in the Study Area and expanding it into a place that might be of benefit to the whole State. In order to enable training to start in 1975 it would be necessary to establish a Fourth Division ADU headquarters during 1974, and this should be at the Kabuloh Farmers Training Institute. The staff required during 1974 would be:-

(a) an experienced Agricultural Officer to be in charge of the whole Fourth Division ADU, and direct the main agricultural activities;

(b) a specialist in agricultural extension training to guide the curriculum to suit the needs of the ADU (the person for this post would probably have to be recruited from outside Malaysia);

(c) an executive officer to relieve the Agricultural Officer of direct involvement in administrative details

such as organising the building of houses, stores and offices, arranging purchase of vehicles, equipment and supplies.

The proposal is that the ADU headquarters should be fully functional by the end of 1974 so that a full complement of trainees could be handled during 1975, using the existing training staff and facilities of the Institute.

Although training of staff could only start in 1975 two ADU Centres are required in that year to work among the farmers in the block alienation scheme already started at Sepupok near Batu Niah, and in the road-based improvement scheme started in Native Customary Land near the first SLDB oil palm plantings in the Lambir-Subis RDA. It has been proposed that these two Centres be established by secondment of staff from the existing extension service of the Department of Agriculture; but from 1976 onwards all ADU staff would be supplied through the Kabuloh Training Centre. The proposed rate of establishment of ADU Centres and their immediate purpose are given in Table 11.6, while the summarised build-up of staff and activities for all the Centres are given in Table 11.7.

TABLE 11.6 THE PROPOSED PROGRAMME FOR ESTABLISHMENT OF ADU CENTRES AND THEIR IMMEDIATE PURPOSE

Year	Rural Development Area	Location of Centre	Main purpose
1975	Lambir Subis	Bukit Peninjau	Support and extend the road based improvement started close to first SLDB oil palm plantings
	Niah Suai	Batu Niah	Support of Sepupok Block Alienation scheme
1976	Marudi	Marudi	Start road based improvement along the new road to Long Linei
	Lambir Subis	Bekenu	Start road based improvement close to the SOP oil palm mill
	Lambir Subis	Mera-a	Support of small-holder farmers in the SLDB sub-scheme
	Lambir Subis	Beluru	Start road based improvement along the new road extending towards Long Lama
	Bintulu	10th mile	Start road based improvement along the Miri-Bintulu road
1977	Niah Suai	Batu Niah	Strong reinforcement of the previously formed centre to start road based improvement along existing roads.
	Long Lama	Long Lama	Start road based improvement along the new road to Long Lama
	Labang - Tubau	Labang	Start road based improvement along the new road connection to the Miri-Bintulu road
1978	Niah Suai	Galasah	Support of small holder farmers in the SLDB sub-scheme
	Niah Suai	Sebanah	Support of small holder farmers in the SLDB sub-scheme
	Labang - Tubau	Tubau	Start road based improvement along the new connection to Labang
1979	Niah Suai	Lamaus	Support of small holder farmers in the SLDB sub-scheme
1980	Niah Suai	Ensabang	Support of small holder farmers in the SLDB sub-scheme
1982	Niah Suai	Telabit	Support of small holder farmers in the SLDB sub-scheme

TABLE 11.7 ESTIMATED BUILD-UP OF STAFF AND ACTIVITIES OF ALL ADU CENTRES ESTABLISHED BY 1982

Year	Staff build-up (cumulative numbers)					Estimated cumulative number of farmers handled	Estimated cumulative crop acres handled				
	Extension Section	Economic Section	Credit and Saving Section	Accounts Section	Total(1) staff		Oil palm	Rubber	Cocoa	Rice	Other crops and enterprises
1975	10	4	4	2	20 (2)	150	(3)	(3)	(3)	(3)	(3)
1976	37	14	9	7	67	704	850	990	190	344	424
1977	52	23	11	10	96	1 184	1 200	3 110	470	604	864
1978	78	41	14	14	147	1 936	1 280	3 900	590	1 139	1 471
1979	105	68	17	18	208	3 082	3 140	4 870	735	1 494	1 906
1980	125	90	18	22	255	3 794	3 380	4 790	735	1 804	2 214
1981	147	107	22	26	302	4 417	7 570	6 020	1 605	1 789	2 099
1982	159	114	25	28	326	4 685	11 350	7 800	2 255	2 069	2 507

(1) Staff in the State and Fourth Division Headquarters are not included.
(2) These personnel need to be seconded from the Agricultural Department extension service.
(3) The acreages for 1975 are not known, but 900 acres of oil palm have been planned for establishment in the road based scheme. Progress has been slower in the Block Alienation Scheme.

11.2.2 The Existing Extension Service

This organisation would have the vital role of sustaining present progress in the more remote parts of the Fourth Division and preparing the people for their eventual inclusion in the expanding intensive development.

Staff requirements for the extension service are expected to increase for at least another decade, thereafter there would be a gradual reduction in numbers as the area covered by intensive development expands.

TABLE 11.8 PRESENT AND ESTIMATED FUTURE STAFF REQUIREMENTS FOR THE DEPARTMENT OF AGRICULTURE EXTENSION SERVICES IN THE FOURTH DIVISION

Staff category	Number of staff*	
	1972	1982
Degree		
Agricultural Officer	1	4
Diplomate		
Assistant Agricultural Officer	7	15
Local Certificate		
Agricultural Assistant	71	170
Total	79	189

Note * Source: Department of Agriculture, Kuching.

Table 11.8 shows the numbers presently employed in extension work in the Fourth Division and the numbers estimated by the Department of Agriculture to be needed in 1982. Expansion on this scale over the whole of Sarawak has been shown in Part III to demand a greater output of personnel than the planned

capacity of the Department's training facilities. Appreciation of this fact has necessitated the suggested establishment of the Kabuloh Training Centre for the ADU staff.

11.23 Research

The existing Kabuloh Research Station is being built-up into the main investigational centre for the northern region of Sarawak. Recently a graduate Research Officer has been posted there, and now the technical research staff stationed at Kabuloh and the rice trial station (Paya Selanyau) consist of one Agricultural Officer, one Assistant Agricultural Officer and five Agricultural Assistants. To handle the future investigational programme there would be need for a gradual increase in staff as is shown in Table 11.9. In addition the Department of Agriculture plans to start its Livestock Production and Animal Husbandry Training Centre at Karabungan soon. The expected staff build-up for that is also shown in Table 11.9.

TABLE 11.9 ESTIMATED TECHNICAL STAFF REQUIRED FOR AGRICULTURAL INVESTIGATION IN THE FOURTH DIVISION

	1974	1975	1976	1977	1978	1979	1980	1990
Kabuloh Research Station								
General Research Scientist and Officer I/C	1	1	1	1	1	1	1	1
Agricultural Economist	-	1	1	1	1	1	1	1
Farm Manager (SAAO)	1	1	1	1	1	1	1	1
Research Assistants (certificate)	4	4	5	6	7	7	7	7
Livestock Production and Animal Husbandry Training Centre								
General Manager (an animal husbandry specialist) (1)		1	1	1	1	1	1	1
Pasture Agronomist		1	1	1	1	1	1	1
Veterinary Officer		1	1	1	1	1	1	1
Veterinary Assistants		1	2	3	4	4	4	4
Agricultural Assistants		1	2	3	4	4	4	4
Laboratory Assistants		1	2	3	4	4	4	4
Experienced Herdsmen (1)		1	2	2	2	2	2	2

(1) These staff would be specially recruited expatriates but they would be replaced by trained local personnel after about 5 or 6 years.

The Beef Cattle Project

This project would require the combined support of SLDB, NLC and the Department of Agriculture.

In addition the Department of Agriculture would be responsible for providing the planting material for the rubber planting associated with road-based improvement and small scale private farming. The type of material would differ according to the circumstances of each scheme. It could be locally

collected seed from selected budded plantations, the seed planted *in situ* and the seedling subsequently budded, or the material could be budded stumps or the larger stumped buddings raised in special central nurseries. All these methods have been used successfully in Sarawak in connection with the Department of Agriculture's subsidised Rubber Planting Schemes.

11.3 THE ROLE OF PRIVATE ENTERPRISE

The proposed rate of allocation of land for private development is shown in Table 11.10, which also gives the recommendations for farm types and the estimated total acreages involved. The estimated acreages of crop that would be planted by private farmers is given in Table 11.11.

TABLE 11.10 PROPOSED RATE OF ALLOCATION OF LAND FOR PRIVATE DEVELOPMENT SHOWING THE TYPE OF FARMS RECOMMENDED AND THE ESTIMATED ACREAGES OF LAND INVOLVED

Allocation scheduled for year	Rural Development Area	Land block concerned	Type of farms recommended	Estimated area of agricultural land (acres)	Remarks
1976	Lambir Subis	Mera-a	Small	560	Oil palm the main crop.
	Lambir Subis	Ulu Mamat	Small	1 980	Oil palm the main crop.
	Lambir Subis	Menantan	Medium	4 500	Part of land is disputed by two local groups of people. Much land is expected to be suitable for beef cattle, the remainder recommended mainly for oil palm.
	Lambir Subis	Ulu Klad	Medium	1 800	Oil palm the main crop.
	Bintulu	Sibiu	Experimental	2 300	Agricultural University farm.
Total 1976				11 140	
1977	Lambir Subis	Ulu Masiat	Medium	3 400	Oil palm the main crop.
	Sekudong	Majam	Medium	4 200	Oil palm the main crop.
Total 1977				7 600	
1978	Lambir Subis	Sungai Klad	Large	12 600	Oil palm the main crop.
	Lambir Subis	Karabungan	Small and Medium	6 800	The main proportion to beef cattle.
Total 1978				19 400	
1979	Niah Suai	Sebanah	Small	1 100	Oil palm the main crop.
	Labang-Tubau	Beseduan	Large	11 800	Rubber probably the main crop.
Total 1979				12 900	
1980	Labang-Tubau	Lebus	Medium	2 300	Rubber probably the main crop.
1981	Niah Suai	Ensabang	Small	900	Oil palm the main crop.
1984	Sekudong	Sungai Medasi	Small	2 700	Oil palm the main crop.
Total (approx.) 1976 to 1984				57 000	

TABLE 11.11 ESTIMATED ACREAGE OF CROPS PLANTED EACH YEAR BY PRIVATE ENTERPRISE IN THE INTENSIVE DEVELOPMENT AREAS (NET ACRES)

Year	Oil palm	Rubber	Cocoa	Other crops
Up to 1976	10 000	Nil	Nil	Nil
1977	1 360	390	120	70
1978	3 150	900	290	160
1979	5 350	1 530	500	270
1980	4 250	3 280	1 280	210
1981	2 400	3 310	1 340	120
1982	2 660	3 370	1 360	140
1983	200	2 660	1 140	10
1984	200	60	20	10
1985	570	160	50	30
1986	570	160	50	30
1987	570	160	50	30

11.4 SUPPORTING GOVERNMENT DEVELOPMENT ACTIVITIES AND AGENCIES

Three aspects would be involved:-

(a) the physical problem of determining the suitability of land for one use or another; this would require semi-detailed soil surveys and land use mapping;

(b) a social and political problem of deciding the boundaries between legal and illegal occupation; this would require adjudication by Administrative Officers;

(c) a physical problem of surveying and demarcating the boundaries; this would involve field survey and demarcation as well as mapping.

11.4.1 Semi-detailed Soil Surveys and Land Use Mapping

The programmes so far given for these activities have assumed that the final boundaries between future agricultural land and future permanent forest areas would be determined before salvage or uncontrolled logging starts. The result would be that during 1974 and 1975 huge tasks would be allocated, not only to the soil survey teams but also to the Land and Survey Department and the Forest Department who together would be responsible for surveying and demarcating the boundaries on the ground.

The particularly large areas to be covered in these two years arose from the need to determine, survey and demarcate boundaries not only in the areas planned for early agricultural development, but also in the forest areas selected for harvesting in the first phases of the three large timber industry complexes operating in FAO Units 1, 2 and 3 (see Supporting Report No. 3, Part I). Included in these first phases

and in several other phases there is land assessed, at the broad transect soil survey level, as having high proportions suitable for agriculture, but there is need to determine and demarcate accurately the boundaries of the land to be allocated to agriculture. The schedules presented are considered the ideal but they impose a very heavy work load on the Soil Survey Division in 1974 and 1975. Alternative procedure must therefore be considered which though less desirable from the forest harvesting view would spread the work load over a longer period.

In one alternative the boundaries would be demarcated, during 1974, 1975 and 1976, on approximately the present broad transect soil survey classification alignments which are shown on the Regional Plan (Map No. 22 in the Map Folder). The forest harvesting could then be conducted on two systems:-

(a) a system in which silvicultural controls are observed, this would be applied in the areas destined to remain under permanent forest;

(b) a system in which no silvicultural controls are observed, this would be applied in the land blocks not included under (a) and of which the greater proportion would be destined for allocation to agricultural development.

This would result in a certain amount of permanent forest land (probably as much as 30 per cent of any one land block) being harvested without proper silvicultural controls because the land unsuitable for agriculture within the blocks would not be identified until after semi-detailed soil surveys had been carried out.

In the second alternative logging would be permitted with silvicultural controls throughout the whole area in question; salvage logging would then be necessary later in the agricultural land finally determined by semi-detailed soil survey.

The method ultimately adopted must be decided by Government whose decision will depend on the availability and commitments of personnel required for the soil surveys, boundary surveys and boundary demarcation in other parts of Sarawak. Table 11.12 gives acreages that would require surveying and mapping in each year under two conditions; one in which the efficiency of forest harvesting is given priority consideration, and one where it is not. Neither condition would interfere with the agricultural plan, but the implications of the delayed surveys for forest exploitation will require study by the Forest Department and the operators of the timber industry complexes. The number of soil survey teams required each year under the two conditions is also shown. For this calculation the assumptions made have been:-

(a) that field work can continue throughout the year (this was found practical by the Consultants under the conditions prevailing during the Study);

TABLE 11.12 THE PHASING OF SEMI-DETAILED SOIL SURVEYS

ASSUMING WORK IS COMPLETED BEFORE FOREST HARVESTING STARTS

Year	Rural development area	Land block concerned	Estimated acreage for survey	Estimated number of teams required*	Remarks
1974	Lambir-Subis	Ulu Masiat	3 150		Required for agriculture
	Lambir-Subis	Ulu Klad	2 900		Required for forestry
	Lambir-Subis	Road-based for Bukit Peninjau	7 300		Required for agriculture
	Niah-Suai	Kabatu	15 000		Required for forestry
	Sekudong	Timong	5 900		Required for forestry
	Sekudong	Segrak	9 450		Required for forestry
	Sekudong	Timkar	6 100		Required for forestry
	Bintulu	Sibiu	3 300		Required for agriculture
	Total		53 100	4	Assuming six months of year remains
1975	Marudi	Road-based for Marudi	5 000		Required for agriculture
	Lambir-Subis	Sungai Klad	17 000		Required for agriculture
	Lambir-Subis	Ulu Masiat	5 500		Required for Agriculture
	Lambir-Subis	Road-based for Bekenu	2 200		Required for agriculture
	Lambir-Subis	Road-based for Bekenu	7 300		Required for agriculture
	Niah-Suai	Kabatu	16 000		Required for forestry
	Sekudong	Majam	6 700		Required for agriculture
	Sekudong	Segrak	9 450		Required for forestry
	Sekudong	Timkar	6 100		Required for forestry
	Sekudong	Sungai Mekasi	4 800		Required for forestry
	Labang-Tubau	Baseduan	18 800		Required for agriculture
	Labang-Tubau	Lebus	4 100		Required for agriculture
	Bintulu	Road-based for 10th mile	4 400		Required for agriculture
	Total		107 350	4	Assuming 12 months work is possible
1976	Niah-Suai	Road-based for Batu Niah	6 200		
	Long Lama	Road-based for Long Lama	5 500		
	Labang-Tubau	Road-based for Labang	3 600		
	Total		15 300	1	Required for six months
1977	Labang-Tubau	Road-based for Tubau	5 500		
	Total		5 500	1	Required for two months
1978	Sekudong	Takau	15 900		
	Sekudong	Sedulang	4 400		
	Total		20 300	1	Required for eight months
1979	Sekudong	Paroh	16 700		
	Nyalau	Nyal	16 400		
	Total		33 100	1	Required for 12 months
1980 to 1982	Nyalau	Kawang	3 300		
	Nyalau	Perihas	10 300		
	Nyalau	Semba	6 200		
	Nyalau	Suroba	6 700		
	Total		26 300	1	Required for three months

ASSUMING WORK IS DELAYED IN SOME LAND BLOCK UNTIL AFTER FOREST HARVESTING STARTS

Year	Rural development area	Land block concerned	Estimated acreage for survey	Estimated number of teams required	Remarks
1974	Lambir-Subis	Ulu Masiat	3 150		
	Lambir-Subis	Road-based for Bukit Peninjau	7 300		
	Bintulu	Sibiu	4 200		
	Total		13 750	1	Assuming six months of year remains
1975	Marudi	Road-based for Marudi	5 000		
	Lambir-Subis	Ulu Klad	2 900		
	Lambir-Subis	Sungai Klad	17 000		
	Lambir-Subis	Ulu Masiat	5 500		
	Lambir-Subis	Road-based for Bekenu	2 200		
	Lambir-Subis	Road-based for Bekenu	7 300		
	Sekudong	Majam	6 700		
	Labang-Tubau	Baseduan	18 800		
	Labang-Tubau	Lebus	4 100		
	Bintulu	Road-based for 10th mile	4 400		
	Total		73 900	3	Required for ten months
1976	Niah-Suai	Road-based for Batu Niah	6 200		6 188 gross 4 335 net
	Long Lama	Road-based for Long Lama	5 500		
	Labang-Tubau	Road-based for Labang	3 600		
	Niah-Suai	Kabatu	15 000		
	Sekudong	Timong	5 900		
	Sekudong	Segrak	9 450		
	Total		45 650		Required for nine months
1977	Labang-Tubau	Road-based for Tubau	5 500		
	Niah-Suai	Kabatu	16 000		
	Sekudong	Timkar	12 200		
	Sekudong	Segrak	9 450		
	Total		43 150	2	Required for nine months
1978	Sekudong	Takau	15 900		
	Sekudong	Sedulang	4 400		
	Sekudong	Sungai Mekasi	4 800		
	Total		25 100	1	Required for ten months
1979	Sekudong	Paroh	16 700		
	Nyalau	Nyal	16 400		
	Total		33 100	1	Required for 12 months
1980 to 1982	Nyalau	Kawang	3 300		
	Nyalau	Perihas	10 300		
	Nyalau	Semba	6 200		
	Nyalau	Suroba	6 700		
	Total		26 300	1	Required for 11 months

Note * The following assumptions have been made in estimating the number of teams required:-
(a) that a team consists of a trained soil surveyor and an assistant with labourers for carrying equipment and samples;
(b) that trace lines are cut by contract labour immediately ahead of the survey team; no delay is assumed to be caused by this operation;
(c) that soil survey work can be undertaken throughout the year (the Consultants' soil surveyors found this practical during the Study);
(d) that a survey team would average 2 500 acres a month that is 30 000 acres a year.

(b) that one field team can survey 30 000 acres a year at an average rate of 2 500 acres a month.

The Table shows that if the forestry demands could be relaxed then the work load on the Soil Survey Division would be considerably reduced. The reduced programme shown allocates the smallest possible acreage to the year 1974, other programmes could be drawn up whereby a greater acreage would be done in 1974 and less in 1975.

The survey would be undertaken by soil survey teams at present in the Research Branch of the Department of Agriculture. However, as recommended in the Main Report, it is suggested that all work associated with the determination, or allocation, of land for future use should be the responsibility of the Land and Survey Department. Thus soil survey work may later come under that Department.

11.4.2 Determination of Boundaries between Legal and Illegal Occupation

This work could be undertaken by Administrative Officers in the particular Divisions and Districts concerned. Suggestions to expedite this work have been given in Part I. The overall programme required for co-ordination with other activities in the Region is shown in Table 11.13. If it is at all possible for some of this work to be completed earlier than indicated it should be done because in practically all areas illegal occupation is expanding and should be halted as soon as possible.

TABLE 11.13 SUMMARY OF BOUNDARY ADJUDICATION REQUIRED TO BE DONE BY THE ADMINISTRATIVE OFFICERS OF THE FOURTH DIVISION

Action required before or during year	Rural Development Area	Land block concerned	Year land is scheduled for release	Agricultural development agency
1974	Lambir Subis	Mera-a	1974	SLDB and private
	Lambir Subis	Menantan	1975	Private
	Lambir Subis	Karabungan	1974-1978	NLC, Agricultural Dept. and private
	Lambir Subis	Ulu Mamat	1975	Private
	Bintulu	Sibiu	1976	Agricultural University
1975	Lambir Subis	Ulu Masiat	1977	Private
	Lambir Subis	Sungai Klad	1977	Private
	Niah-Suai	Galasah	1976	SLDB
	Niah-Suai	Sebanah	1976	SLDB and Private
	Sekudong	Timkar	1984	SLDB
	Sekudong	Majam	1976	Private
	Sekudong	Sungai Mekasi	1984	Private
	Labang-Tubau	Beseduan	1978	Private
	Labang-Tubau	Lebus	1979	Private
1976	Niah-Suai	Lamaus	1977	SLDB
1977	Niah-Suai	Ensabang	1978	SLDB and Private
1978	Niah-Suai	Jatan	1979	SLDB
	Niah-Suai	Telabit	1979	SLDB
1980	Nyalau	Nyal	1987	SLDB
	Nyalau	Kawang	1989	SLDB

11.4.3 Survey and Demarcation of Boundaries

The programmes for surveying and demarcating the boundaries associated with agricultural development are summarised in Table 11.14. To complete this huge task on schedule would require some speeding up of the present rates of survey. At

TABLE 11.14 PROGRAMME OF BOUNDARY SURVEYS TO BE UNDERTAKEN BY THE LAND AND SURVEY DEPARTMENT

Year	Rural Development Area	Land block concerned	Estimated length of boundary (miles)	Estimated number of survey teams* required	Remarks
				Using compass and chain system Number of teams	
1974	Lambir Subis	Mera-a	22		
	Lambir Subis	Menantan	20		
	Lambir Subis	Karabungan	16		
	Lambir Subis	Ulu Mamat	6		
	Niah-Suai	Igang	10		
	Bintulu	Sibiu	23		
Total 1974			97	2	Assuming only 6 months of year remains
1975	Lambir Subis	Ulu Masiat	10		
	Lambir Subis	Ulu Klad) Sungai Klad)	35		
	Niah Suai	Glasah	16		
	Niah Suai	Sebanah	22		
	Niah Suai	Kabatu	45		
	Sekudong	Timong) Timkar)	44		
	Sekudong	Majam	26		
	Sekudong	Sigrak	42		
	Sekudong	Sungai Mekasi	12		
	Labang-Tubau	Beseduan	26		
	Labang-Tubau	Lebus	13		
Total 1975			291	2	Assuming 12 months work is possible
1976	Miri	Sungai Dalam National Park	7		
	Niah Suai	Sawai	7		
Total 1976			14	2	Assuming teams work for 1½ months
1977	Long Lama	Loagan Bunut National Park	20		
	Niah Suai	Ensabang	19		
Total 1977			39	1	Assuming teams work for 4 months
1978	Niah-Suai	Jatan	11		
	Niah-Suai	Telabit	13		
	Sekudong	Sedulang	11		
	Sekudong	Takau	28		
Total 1978			63	1	Assuming teams work for 5 months
1979	Sekudong	Paroh	27		
	Nyalau	Nyal	44		
Total 1979			71	1	Assuming teams work for 6 months
1980 to 1982	Nyalau	Kawang	37		
	Nyalau	Perihas	21		
	Nyalau	Semba	32		
	Nyalau	Suroba	30		
	Nyalau	Similajau National Park	32		
Total 1980 to 1982			152	1	Assuming teams work 4 months a year

* Assumptions concerning survey teams.
(1) A chain and compass team consists of 1 Demarcater, one chainman and 8 labourers. A team can complete 1 000 chains per month; average 12 miles per month.

present a first demarcation on the ground of boundaries aligned by chain and prismatic compass is undertaken; more accurate theodolite survey follows later. Such procedure cannot be expedited but consideration should be given to increasing the rate of work of field teams by increasing the number of labourers per team and by the issue of chain-saws. Assuming that the rate of work of a prismatic compass and chain team could be increased to 1 000 chains per month, then the number of teams required in any one year would not be too great, as can be seen from Table 11.14.

The Land and Survey Department would undertake all the survey work, but responsibility for permanent demarcation of boundaries could be divided between that Department and the Forest Department on the following basis:-

(a) all boundaries associated with future permanent Forest Reserves would be Forest Department's responsibility;

(b) all other boundaries, that is those between agricultural development on State Land and Native Customary Land, would be the responsibility of the Land and Survey Department.

CHAPTER 12

FARM BUDGETS AND INCOMES OF PUBLIC SECTOR SETTLEMENT SCHEMES

12.1 INTRODUCTION

The development patterns proposed for the areas of State Land allocated to public sector schemes have been selected to ensure that the standards of management and crop husbandry would be consistent with the achievement of reasonably high yields and returns. This has been considered necessary in order to justify the investment of public funds in these schemes. The economic evaluation of the agricultural schemes and the overall agricultural plan appears in Chapter 13. In the present Chapter the returns to the individual farmers or workers on the two types of public sector settlement schemes are examined in terms of the following:-

- planning criteria and cropping pattern;
- revenues and costs;
- labour requirements or employment;
- farm incomes and repayment capacity; and
- possible variations due to price and interest rate charges.

This is the pattern of the main analyses but first possible target family incomes in the agricultural sector are examined.

12.2 THE TARGET FAMILY INCOMES

There is little information available on current earnings of farmers or workers in the traditional agricultural sector. Nevertheless for planning purposes it has been necessary to define income levels which would be sufficient for a family to maintain a reasonable living standard in terms of food, clothing, education, health, housing and transport requirements.

Recent FELDA projects in Peninsular Malaysia have aimed at providing settlers with an income of about $300 per month after meeting all production expenses and repayments of development costs.

A farm survey was carried out in the Study Area during 1973 to determine present patterns of agricultural activity. The survey indicated that the average potential net income of farmers in the traditional agricultural sector is about $2 530 per annum. Actual incomes however are much lower than this due to failure of crops in some seasons and reduced rubber tapping, also over 60 per cent of the farm income is contributed by subsistence consumption items (see Appendix VI).

Further information on household expenditure patterns was derived from the 1967/68 Household Budget Survey. Analysis of expenditure by the lower income group, up to $300 per month, reveals the following typical pattern:-

Expenditure category	Amount per annum $
Food items	1 100
Housing	275
Other items including education, medical, transport, fuel, lighting and clothing	569
Total annual expenditure	$1 944

This has been taken as a minimum and a benchmark against which incomes derived from various types of holdings or settlement patterns might be checked. For planning purposes the income requirements of families in the public sector schemes developed on State Land have been related to an earning potential based on the following:-

(a) two potential full time workers per family;

(b) an average take-home wage ranging from $4.50 to $5.00 per day;

(c) the average number of days worked in a year would be 285.

On this basis the earning potential or income of the average family would range from $2 560 to $2 850 per annum. Therefore, an income of between $2 500 to $3 500 per annum has been considered acceptable.

12.3 FARM BUDGETS FOR SMALL-HOLDER SCHEMES

There are six small-holder schemes proposed for development during the Action Programme period 1975 to 1980, and the areas of crops recommended for them are as follows:-

Scheme name	Total area of land under crops			
	Oil palm	Rubber	Cocoa	Rice
Mera-a	1 890	875	120	195
Galasah	1 560	495	315	160
Sebanah	2 385	920	560	265
Lamaus	3 100	1 260	510	330
Ensabang	3 490	1 270	-	300
Telabit	2 455	1 370	160	180
Total	14 880	6 190	1 665	1 430
Percentage of area	62	26	7	6

12.3.1 Planning Criteria

The planning criteria which were used as a basis for establishing farm sizes and cropping patterns for the holding types proposed were:-

(a) each settler family would have a one acre homestead plot and one acre plot of rice;

(b) each small-holding would have not less than two and preferably not more than three permanent cash crops;

(c) the estimated labour requirements for working the holdings would be within the capacity of a family of two fully employed man-units (this aspect is further discussed in Section 12.3.3);

(d) for management reasons the minimum acreage allowed for holding for particular tree crops would be:-

	Acres
Oil palm	8
Rubber	4
Cocoa	4

(e) farm sizes would, as far as possible, be uniform since uncertainties regarding future price movements of individual crops would make fine distinctions in land allocations rather meaningless, on the other hand, for practical planning purposes exact allocation of the acreages indicated would also be difficult to achieve due to the interaction of physical features and layout requirements suited to the particular crop on an actual scheme;

(f) the farm sizes would be set at a level sufficient to meet the following income and financial requirement:-

- minimum family income of $2 500 by the sixth or seventh year from planting;
- complete amortisation of housing, land development and crop establishment costs within a period of about 20 years from planting at an interest rate of seven per cent per annum;
- provision for replanting funds to be set up during the productive life of the tree crops.

The actual acreages of tree crops which would be allocated to each type of small holding were worked out to be consistent with the overall cropping patterns of the individual schemes. The resulting farm types are summarised in Table 12.1.

The size of the holdings derived are quite large, in fact as large as the labour requirement criteria permits, but this has been considered desirable for the following reasons:-

(a) the uncertainty attached to the price and yield projections on which the farm returns have been based. Although long term price falls have been predicted (see Part IV) there remains a high degree of uncertainty as to the rate of fall and the incidence of wide short term fluctuations; even a relatively small variation would

TABLE 12.1 CROPPING PATTERN OF FARM TYPES DERIVED FOR SMALL-HOLDER SCHEMES

Crop	Net acres of crop planted per holding				
	a	b	c	d	e
Oil palm	9	10	11	10	9
Rubber	6	5	4	-	-
Cocoa	-	-	-	4	5
Rice	1	1	1	1	1
Homestead plot	1	1	1	1	1
Total cropped acreages	17	17	17	16	16

have a considerable effect on the net income derived from the crop;

(b) the holdings of these sizes provide reasonable opportunities for flexibility in future in terms of cropping patterns, husbandry techniques and improved management skills. These developments will be necessary to ensure increasing incomes over time;

(c) reserve funds could be built up without undue strain on the farm economy. These funds could provide for replanting and could be drawn upon in the event of repayment failure or to make up deficiencies when prices fall and incomes are low. Thus they would help to provide income stability.

12.3.2 Revenues and Costs

The basis for estimating the costs of developing and operating the various crops are described in Part IV, and housing costs in Supporting Report No. 8. An explanation of the various items involved is given here with the basic distinction being made between three periods:-

(a) the development or investment period;
(b) the production or repayment period; and
(c) the post-repayment period.

(a) Development Period (Years 0 to 4)

Earlier Sections of this Report make it clear that during the initial development period the SLDB would be responsible for establishing the tree crops and bringing them into production, for constructing the internal road networks and drainage works required for the crop areas of the schemes, and for organising the building of houses.

The costs of clearing the land, establishing and maintaining the various crops over this period for the five farm types

TABLE 12.2 SMALL-HOLDING DEVELOPMENT COSTS (YEARS 0 TO 4) (DOLLARS)

Item	Farm type				
	a	b	c	d	e
Land development costs	6 457	6 634	6 781	7 167	7 184
Crop production costs	9 584	10 975	11 124	11 247	11 325
Management costs	5 305	4 843	4 778	4 477	4 541
Sub-total	21 346	22 452	22 683	22 891	23 050
Net revenue from sale crops (years 3 and 4)	2 693	2 992	3 291	3 882	3 806
Total net cost per holding (excluding interest)	18 653	19 460	19 392	19 009	19 244
Average cost per acre (excluding house and homestead plot)	1 165	1 216	1 212	1 267	1 283

are summarised in Table 12.2. Details are given in Appendix III. All costs would be aggregated on a scheme basis, including labour and management costs and accrued interest at seven per cent until the end of year four when the SLDB responsibility would be allocated to individuals and the costs distributed to individual small-holder accounts on the basis of the crop areas allocated to each holding. Physical allocation of rubber plots would not occur until the seventh year; while rice plots would be allocated immediately clearing drainage and levelling has been completed.

(b) Repayment Period

For practical purposes the repayment period has been assumed to commence in the fifth year when management of the scheme would be taken over by the ADU and settlers would be allocated plots of oil palms and cocoa. The major determinant of the repayment potential of any holding would be the net income available after all current operating costs have been covered.

The length of the pay-back period as explained earlier, should not be longer than 20 years from planting, allowing some 15 years of actual repayment after hand-over of plots to individuals. A longer period would unlikely to be acceptable on social grounds and, due to the large interest element in repayment would have little effect on the settlers cash income position. On the other hand, too short a period would place an undue financial burden on the farmer.

(c) Post-Repayment Period

Once the full development costs of the holding have been repaid the farmer would become virtually independent and assume title to his land on whatever terms are operative at the time. During this period tree crops would require replanting and for this purpose it is proposed that replanting funds are established by means of levies for the crops involved.

Payment for the construction of the house would cease in year 20 and it may be necessary to rebuild the house during this period. Thus it would be important that the income is adequate to provide sufficient funds for this purpose. This and other requirements, such as improved personal transportation, indicate the need for a fairly high income in this period.

12.3.2.1 Revenues

The gross revenue or income for tree crops has been taken as the value of total production of each crop at the market prices (fob value) derived in Part IV. For simplicity of presentation in the analysis all holdings have been assumed to have a common planting year (1976). The net farm revenues for the holdings have been derived by deduction of the ex-farm costs which are:-

(a) processing charges levied by the SLDB or group operated facilities for oil palm, rubber and cocoa;

(b) transport costs from the farm to the processing centre;

(c) distribution costs from the processing centre to port including port handling charges;

(d) export duties on palm oil and rubber.

The rates on which these costs have been calculated are given in Table 12.3.

The net value of crops and livestock produced on the homestead has been assessed as follows:-

Year	Dollars
2	100
3	100
4	200
5	200
6 onwards	300

The activities likely to be undertaken on the homestead plots include the growing of annual food crops, pepper, spices and fruits, trees, the rearing of poultry and pigs and small scale fresh water pond enterprises.

TABLE 12.3 EX-FARM COST FOR OIL PALM, RUBBER AND COCOA CROPS ON SMALL-HOLDINGS (DOLLARS PER TON)

Crop	Duty	Transport to processing centre	Processing	Distribution to port and port handling
Oil palm ffb	NA	3.0	12.0	NA
Palm oil	30.4*	-	-	9.5
Palm kernels	NA**	-	-	6.0
Rubber drc	60.5	15.2	140.0	39.9
Cocoa dbe	NA	3.0	78.4	35.8

Note * Duty payable from 1985 onwards, decreasing from the 1975 level of $39.8 per ton.
** No duty assumed to be payable on palm kernels shipped to Peninsular Malaysia or crushed locally.

NA = Not applicable
ffb = fresh fruit bunches
drc = dry rubber content
dbe = dry bean equivalent

12.3.2.2 Costs

The costs of establishing and maintaining individual crops are derived in Part IV. These have been used here to estimate the costs of developing and maintaining the various types of small-holdings. Two types of costs have been distinguished.

(a) Land Development Costs

Land clearing, road construction and drainage of the cropped area are included under this heading. After initial construction, there would be continuing costs of road and drain maintenance. The total development costs for each farm type are summarised in Table 12.4 and details given in Appendix III.

TABLE 12.4 LAND DEVELOPMENT COSTS OF SMALL-HOLDINGS - DOLLARS

Crops	Farm types				
	a	b	c	d	e
Oil palm	3 844	4 272	4 670	4 272	3 844
Rubber	1 498	1 247	996	-	-
Cocoa	-	-	-	1 780	2 225
Rice	1 115	1 115	1 115	1 115	1 115
Overall total	6 457	6 634	6 781	7 167	7 184
Average cost per acre	404	415	424	448	449

(b) Production

Crop production costs here cover materials expended on planting and maintenance of the crops including the following:-

Tree crops - leguminous covers, shade, planting materials, fertilisers, herbicides, disease and pest control, tools and equipment.

Rice - land preparation, seed, fertilisers, herbicides and pesticides.

In the analysis the labour costs during the development period have been included in the crop production costs but thereafter all on-farm operations have been assumed to be carried out by the settler and his family and labour costs have been excluded from the budgets.

12.3.2.3 Housing and Homestead Plots

The cost of clearing the one acre homestead plot and constructing the house in year two has been estimated at $4 500. In the analysis this cost, with accrued interest at seven per cent, has been treated as a separate entity to other development costs and has been amortised over 15 years, from year five onwards, on an annuity basis at $235 per annum. Further development of the homestead plot has been assumed to be financed by the settler from his own resources, with assistance from the ADU.

12.3.2.4 Rice Plots

The initial clearing, drainage and levelling of the land for rice would be undertaken by the SLDB and then handed over, in year two to the ADU for allocation to settlers when the first crop would be produced. Development costs, estimated at $1 050 per acre, would be charged on a pro-rata basis according to the actual acreage allocated to each individual.

12.3.2.5 Management

Initially the management of the area would be under the SLDB but ultimately the small-holdings would be the farmers responsibility with the technical advice and assistance of the ADU or a Farmers Organisation which might develop in time. The costs of these services have been included in the budgets on the following basis:-

(a) all SLDB management costs during the development period. This departure from the current Government practice on existing schemes of not charging these costs has been considered necessary for the following reasons:-

- the SLDB would be acting as a development contractor and as such the management charges would be part of

the cost chargeable to each scheme;

- the costs of managing the establishment of the schemes would be considerable and should be recovered from the individuals benefitting from them if the schemes are not to become an encumberance on the rest of the agricultural economy;

(b) those ADU or Farmers Organisation costs involved in providing the supply and credit services to the schemes. At present it is customary for Government to provide free technical advice to farmers but in the proposed development plan these services would be directly involved in procuring and supplying agricultural requisites and credit. There appears to be no justification for subsidies here especially when in time these functions should be taken over by farmers' organisations or co-operatives. In the analysis the following charges have been allowed for:-

Year 5	-	$200 per holding
Year 6	-	$290 per holding
Year 7 and onwards	-	$320 per holding

12.3.2.6 Interest

A seven per cent rate of interest has been charged on development investments. This rate is considered reasonable for long term agricultural loans in Sarawak although the opportunity cost of capital is nearer 10 per cent. A higher rate of interest would reduce farm incomes and returns to land which would be undesirable from the socio-economic view point. It would however be necessary to keep the interest rate under review in future to ensure that it was consistent with international lending rates.

Since a constant price assumption has been applied throughout all the farm budget calculations an exercise has been carried out (see Section 12.3.5.2) to examine the effect of inflation on real interest costs. The rate of inflation has been assumed to be five per cent in which case the real interest rate would be only two per cent to the small-holder.

12.3.2.7 Replanting Fund Levy

The tree crops selected for development have been assumed to have a productive life of 20 to 25 years after which replanting would be required. For budgeting purposes a sinking fund has been assumed to be established during the productive life of the crop in the post-repayment period to cover the costs of replanting when it becomes necessary. Costs of replanting are derived in Part IV. Examples of the annual costs per acre of crop calculated on a sinking fund basis, with interest of seven per cent, are as follows:-

Crop	Number of years after repayment to create replanting fund	Replanting fund	Replanting costs discounted to clearing year $ per acre	Annual cost
Oil palm	8	25	759	74
Rubber	13	30	1 287	64
Cocoa	13	30	1 230	61

123.3 Labour Requirements

The labour requirements of oil palm, rubber and cocoa are high during early establishment and then decline until harvesting commences when they increase again until peak production is achieved. Thereafter they remain at a more or less steady level. In the case of oil palm due to pollination inputs there is a subsidiary peak during the first three years of production.

The labour requirement for rice would remain the same each year. The annual requirement per acre is estimated at about 45 man days but this would be concentrated into short periods of two to three weeks duration. During these periods it is likely that the full family labour force would be required leaving little available for handling the tree crops. This aspect has been one of the main reasons for recommending rice plots of only one acre per family and for recommending as much mechanical aid as possible.

The annual labour input requirements of the various holdings based on detailed labour requirements given in Part IV are summarised in Table 12.5 when it is shown that on an annual basis the work load would not exceed the capacity of the average family consisting of two full time worker equivalents.

TABLE 12.5 LABOUR REQUIREMENTS FOR TREE CROP PRODUCTION ON THE PROPOSED SMALL-HOLDINGS

Year of scheme	1	2	3	4	5	6	7	8	9	10	11	12 and following
Farm type (a)												
Total man days	375	255	272	317	289	240	344	410	404	424	428	444
Worker equivalents required	1.3	0.9	1.0	1.1	1.0	0.8	1.2	1.4	1.4	1.5	1.5	1.6
Farm type (b)												
Total man days	360	245	274	330	306	253	339	390	379	396	399	412
Worker equivalents required	1.3	0.9	1.0	1.2	1.1	0.9	1.2	1.4	1.3	1.4	1.4	1.5
Farm type (c)												
Total man days	344	234	276	343	322	265	334	369	353	367	370	380
Worker equivalents required	1.2	0.8	1.0	1.2	1.1	0.9	1.2	1.3	1.2	1.3	1.3	1.3
Farm type (d)												
Total man days	237	278	313	355	354	317	317	296	274	274	274	274
Worker equivalents required	0.8	1.0	1.1	1.3	1.2	1.1	1.1	1.0	1.0	1.0	1.0	1.0
Farm type (e)												
Total man days	231	303	325	352	352	323	323	304	284	284	284	284
Worker equivalents required	0.8	1.1	1.1	1.2	1.2	1.1	1.1	1.1	1.0	1.0	1.0	1.0

12.3.4 Farm Incomes and Repayment Capacity

12.3.4.1 Incomes During the Development Period

During the development period (as defined in Section 12.3.2) it has been assumed that the settler family would receive wages paid for work done in establishing the main tree crops, in addition there would be the net value of rice and homestead crops produced. The estimated earnings for each type of holding are summarised in Table 12.6. Details are given in Appendix III.

TABLE 12.6 ESTIMATED SMALL-HOLDER INCOMES DURING THE FARM DEVELOPMENT PERIOD

Farm type	Item	Earnings ($) per year of scheme			
		1	2	3	4
a	Wages	1 878	1 274	1 359	1 585
	Rice and homestead plot	-	280	320	475
	Total	1 878	1 554	1 679	2 060
b	Wages	1 798	1 223	1 370	1 650
	Rice and homestead plot	-	280	320	475
	Total	1 798	1 503	1 690	2 125
c	Wages	1 717	1 172	1 381	1 715
	Rice and homestead plot	-	280	320	475
	Total	1 717	1 452	1 701	2 190
d	Wages	1 184	1 391	1 564	1 773
	Rice and homestead plot	-	280	320	475
	Total	1 184	1 671	1 884	2 248
e	Wages	1 155	1 514	1 623	1 757
	Rice and homestead plot	-	280	320	475
	Total	1 155	1 794	1 943	2 232

12.3.4.2 Incomes During the Repayment Period

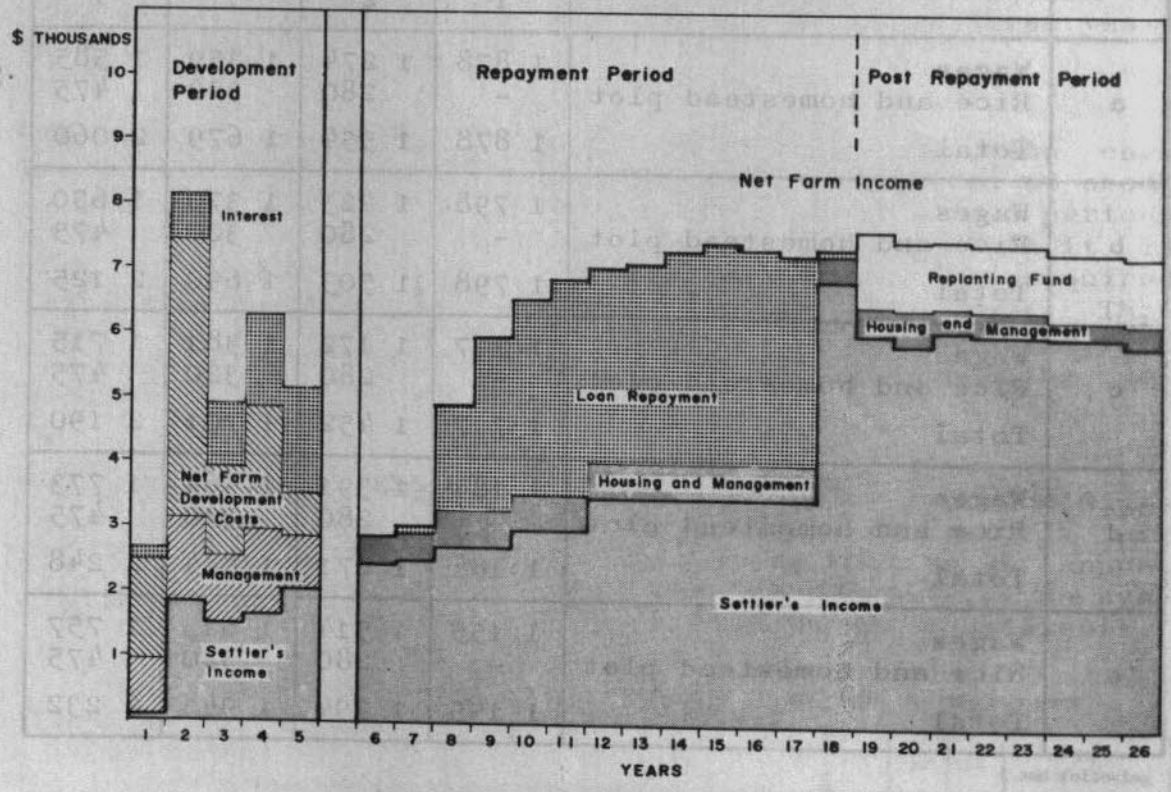
The net farm incomes for each holding type from the fifth year onwards have been calculated in the analysis as the surpluses remaining after allowing the following revenues and costs:-

- the gross value of farm production; less
- ex-farm costs of duty, transport, and distribution of the crops sold;
- on-farm costs of development and production items including road and drain maintenance, fertilisers and other chemicals, small tools and equipment;

- the house amortisation cost of $235 per annum;
- the management charges for the supply services.

During the period of repayment of development costs the settlers income would be this income less the repayments and interest charges on the accumulated development costs. A summary of the farm budgets showing the net farm incomes and settlers income generated by the five farm types is given in Table 12.7 and shown graphically in Figures 12.1 to 12.5. Details are given in Appendix III.

FIGURE 12.1



12.3.4.3 Repayment Capacity

The repayment potential of each holding would be determined by:-

- the total income produced by the crops on the holding;
- the costs of production and other charges associated with holding operation;
- the income required by the settler.

FIGURE 12.2

INVESTMENT FARM TYPE (b)

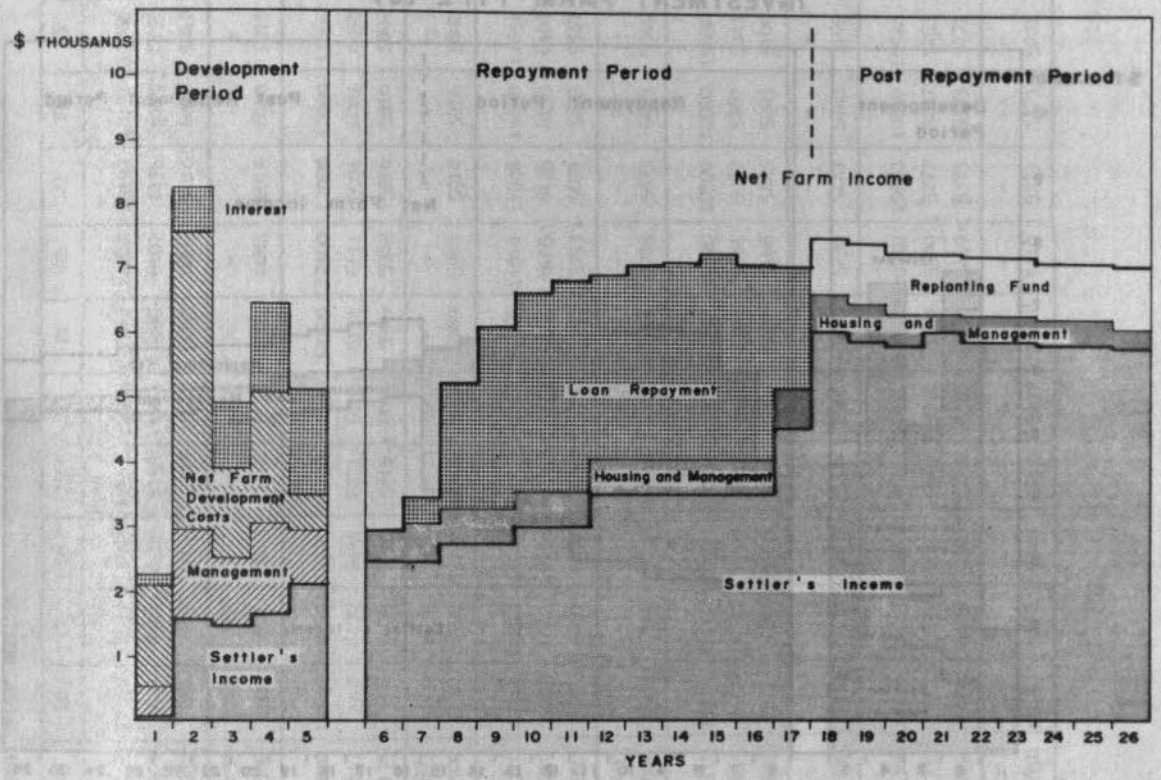


FIGURE 12.3

INVESTMENT FARM TYPE (c)

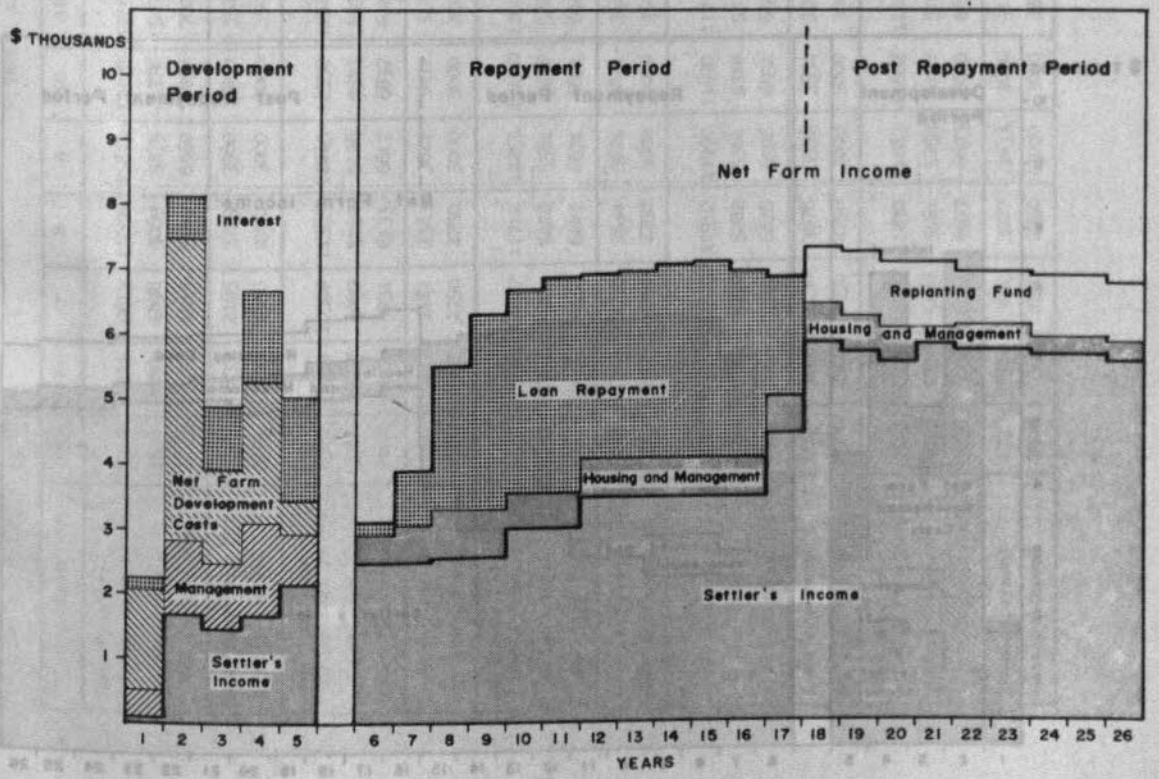


FIGURE 12.4

INVESTMENT FARM TYPE (d)

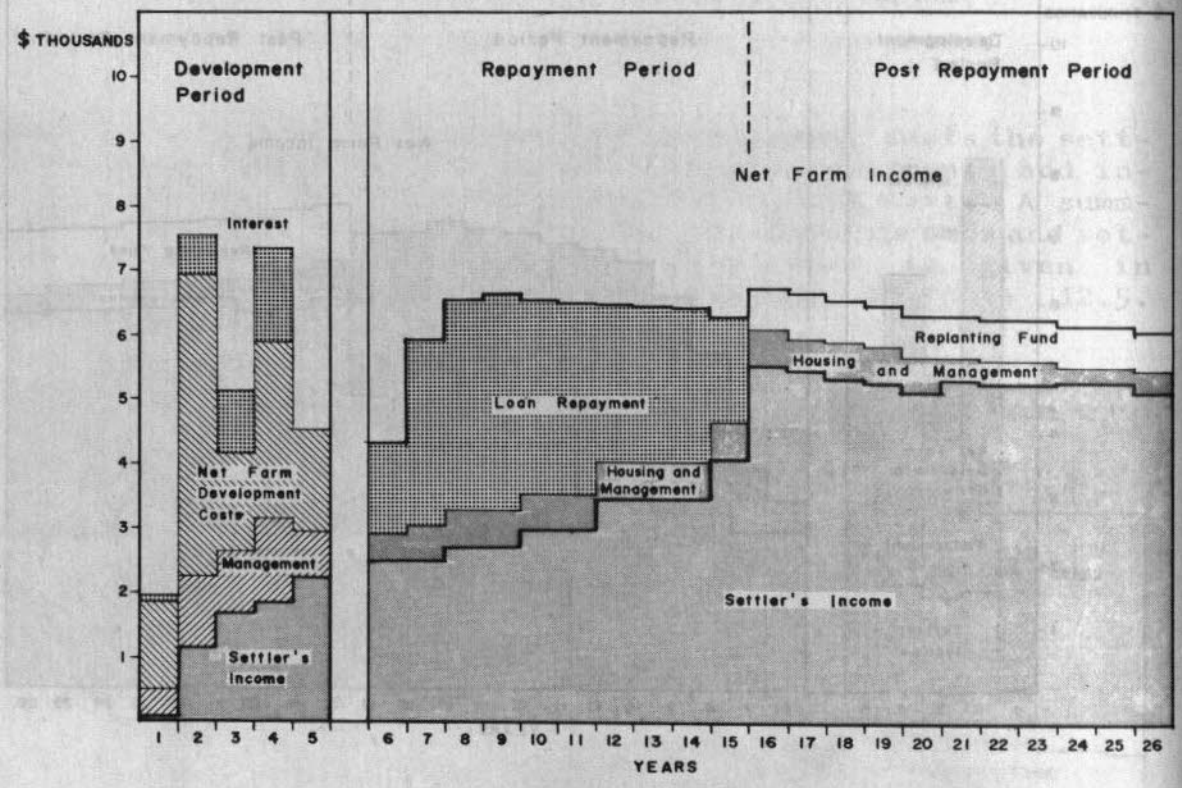


FIGURE 12.5

INVESTMENT FARM TYPE (e)

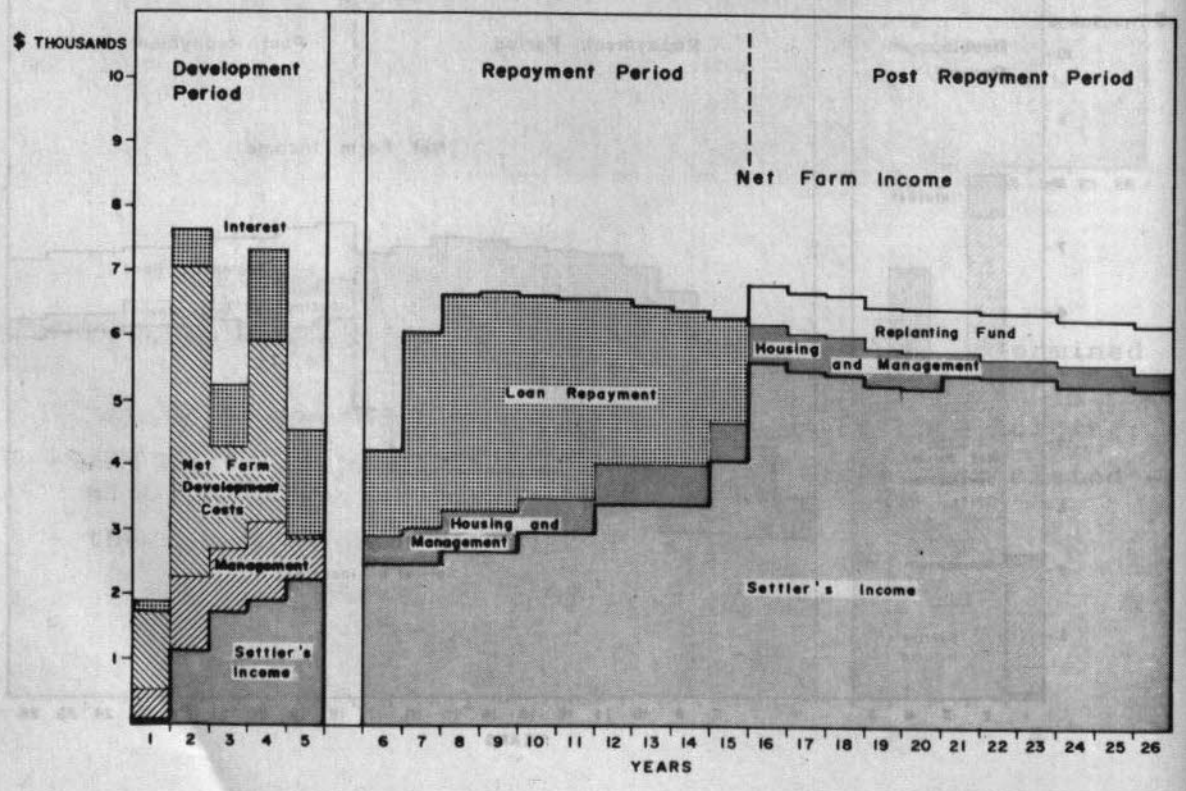


TABLE 12.7 SUMMARY OF SMALL-HOLDER FARM BUDGETS

Year	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Farm type (a)																					
Gross farm revenue	5963	7224	9813	11058	11835	12228	12462	12675	12879	13011	12930	12768	12687	12525	12363	12363	12282	12282	12192	12192	12066
Total costs	3538	4291	4898	5069	5275	5378	5433	5532	5576	5598	5577	5528	5500	6502	6456	6221	6197	6197	6174	6174	6150
Net farm income	2425	2933	4915	5989	6560	6850	7029	7143	7303	7413	7353	7240	7187	6023	5907	6142	6085	6085	6018	6018	5916
Loan repayment	-	433	2165	3239	3560	3850	3529	3643	3803	3913	3853	3740	343	-	-	-	-	-	-	-	-
Settler income	2425	2500	2750	2750	3000	3000	3500	3500	3500	3500	3500	3500	6844	6023	5907	6142	6085	6085	6018	6018	5916
Farm type (b)																					
Gross farm revenue	6560	7950	10320	11385	12045	12350	12545	12700	12845	12910	12820	12640	12550	12370	12190	12190	12100	12100	12000	12000	11860
Total costs	3791	4527	5089	5252	5428	5513	5559	5635	5665	5670	5647	5592	6477	6424	6371	6136	6111	6111	6084	6084	6058
Net farm income	2769	3423	5231	6133	6617	6837	6986	7065	7180	7240	7173	7048	6073	5946	5819	6054	5989	5989	5916	5916	5802
Loan repayment	269	923	2481	3383	3617	3837	3486	3565	3680	3740	3673	2508	-	-	-	-	-	-	-	-	-
Settler income	2800	2500	2750	2750	3000	3000	3500	3500	3500	3500	3500	4540	6073	5946	5819	6054	5989	5989	5916	5916	5802
Farm type (c)																					
Gross farm revenue	7157	8676	10827	11712	12255	12472	12628	12725	12811	12809	12710	12512	12413	12215	12017	12017	11918	11918	11808	11808	11654
Total costs	4043	4762	5279	5428	5581	5648	5684	5738	5755	5742	5717	5657	6544	6486	6427	6192	6165	6165	6135	6135	6107
Net farm income	3114	3914	5548	6284	6674	6824	6944	6987	7056	7067	6993	6855	5869	5729	5590	5825	5753	5753	5673	5673	5547
Loan repayment	614	1414	2798	3534	3674	3824	3444	3487	3556	3567	3493	2372	-	-	-	-	-	-	-	-	-
Settler income	2500	2500	2750	2750	3000	3000	3500	3500	3500	3500	3500	4483	5869	5729	5590	5825	5753	5753	5673	5673	5547
Farm type (d)																					
Gross farm revenue	8560	10950	11800	11910	11960	11870	11870	11780	11680	11500	11410	11230	11140	10960	10780	10780	10690	10690	10590	10590	10450
Total costs	4231	4984	5220	5282	5364	5316	5316	5291	5264	5212	5845	5790	5802	5707	5654	5419	5394	5394	5367	5367	5341
Net farm income	4329	5966	6580	6628	6596	6554	6554	6489	6416	6288	5565	5440	5338	5253	5126	5361	5296	5296	5223	5223	5109
Loan repayment	1829	3466	3830	3878	3596	3554	3054	2989	2916	2189	-	-	-	-	-	-	-	-	-	-	-
Settler income	2500	2500	2750	2750	3000	3000	3500	3500	3500	4099	5565	5440	5338	5253	5126	5361	5296	5296	5223	5223	5109
Farm type (e)																					
Gross farm revenue	8463	10974	11739	11838	11883	11802	11802	11721	11631	11469	11388	11226	11145	10983	10821	10821	10740	10740	10650	10650	10524
Total costs	4227	4890	5106	5161	5250	5192	5192	5170	5146	5099	5730	5681	5657	5657	5559	5324	5300	5300	5277	5277	5253
Net farm income	4236	6084	6633	6677	6633	6610	6610	6551	6485	6370	5658	5545	5488	5326	5262	5497	5440	5440	5373	5373	5271
Loan repayment	1736	3584	3883	3927	3633	3610	3110	3051	2985	2183	-	-	-	-	-	-	-	-	-	-	-
Settler income	2500	2500	2750	2750	3000	3000	3500	3500	3500	4187	5658	5545	5488	5326	5262	5497	5440	5440	5373	5373	5271

For each holding type a development loan repayment schedule has been calculated assuming that the total balance available after satisfying the above needs would be applied to capital recovery and interest charges on the outstanding amounts. The results of these calculations and the pay-back periods for each holding are summarised in Table 12.8 and detailed in Appendix III. The calculations demonstrate that the incomes generated by all the farm types would be sufficient for pay-back within 20 years from planting.

TABLE 12.8 REPAYMENT CAPACITY OF SMALL-HOLDERS

Holding type	Accumulated investment* at start of repayment	Pay-back period in years	
		From clearing	From holding allocation
	$		
a	24 560	17	12
b	24 267	16	11
c	24 173	16	11
d	23 641	14	9
e	23 925	14	9

Note * Including funded interest at seven per cent.

12.3.5 Possible Farm Budget Variations

Two situations have been examined here to account for possible increases in the price of rubber and the effect of inflation on the interest rate. A third situation simulating the payment of a land rent is discussed in Appendix V.

12.3.5.1 Raised Rubber Prices

Because rubber prices cannot be predicted with any certainty due to the present world economic situation it has been considered necessary to examine the situation in which rubber prices increased by 20 per cent. A revised farm budget for farm type (b) has been calculated and a summary of this is given in Table 12.9. Details of the budget are given in Appendix III.

The effect of the price increase would be:-

(a) the repayment capacity of the holding would be increased and the pay-back period would be slightly shorter, 15 years instead of 16;

(b) net farm income during the post-repayment period would be increased by some 16 per cent.

TABLE 12.9 ALTERNATIVE SMALL-HOLDERS BUDGETS

Year	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Farm type (a) with raised rubber price, 7 per cent rate of interest																					
Gross farm revenue	6560	7950	10624	11880	12662	13046	13280	13484	13678	13792	13702	13522	13432	13252	13072	13072	12982	12962	12882	12882	12742
Total costs	3791	4527	5113	5289	5475	5565	5615	5694	5728	5737	5714	6464	6434	6361	6328	6328	6303	6303	6276	6276	6250
Net farm revenue	2791	3423	5511	6591	7187	7481	7665	7790	7950	8055	7988	7058	6998	6871	6744	6744	6679	6679	6606	6606	6492
Loan repayment	269	923	2761	3841	4187	4481	4165	4290	4450	4555	1348	-	-	-	-	-	-	-	-	-	-
Settler income	2500	2500	2750	2750	3000	3000	3500	3500	3500	3500	6640	7058	6998	6871	6744	6744	6679	6679	6606	6606	6492
Farm type (b) assuming 2 per cent rate of interest																					
Gross farm revenue	5963	7224	9813	11058	11835	12228	12462	12675	12879	13011	12930	12768	12687	12525	12363	12363	12282	12282	12192	12192	12066
Total costs	3538	4291	4898	5069	5275	5378	5433	5532	5576	6393	6372	6323	6295	6247	6201	5966	5942	5942	5919	5919	5895
Net farm revenue	2425	2933	4915	5989	6560	6850	7029	7143	7303	6618	6558	6445	6392	6278	6162	6397	6340	6340	6273	6273	6171
Loan repayment		433	2165	3239	3560	3850	3529	3643	2722	-	-	-	-	-	-	-	-	-	-	-	-
Settler income	2425	2500	2750	2750	3000	3000	3500	3500	4581	6618	6558	6445	6392	6278	6162	6397	6340	6340	6283	6273	6171

12.3.5.2 Diminished Interest Rate

As explained in Section 12.3.2.6 an assumed inflation rate of five per cent in the general economy would reduce the real interest rate from seven to two per cent per annum. The effect of this has been examined for farm type (a) and the revised loan repayment statement for the holding is given in Table 12.9. The decreased interest charge would reduce the pay-back period by 24 per cent from 17 to 13 years.

12.4 THE SLDB SCHEME BUDGETS

Three SLDB sub-schemes are proposed for development during the Action Programme period, 1975 to 1980. They have the following cropping patterns:-

Sub-scheme	Net areas of crops planted			
	Oil palm	Rubber	Cocoa	Total
Igang	3 245	370	-	3 615
Sawai	2 620	645	270	3 535
Jatan	5 320	770	450	6 540
Total (acres)	11 185	1 785	720	13 690
Percentage of area	82	13	5	100

12.4.1 Planning Criteria

These sub-schemes are intended to be developed and operated as one estate according to SLDB policy. At present SLDB oil palm schemes are operated as estates on which workers are employed on a wage basis while on rubber schemes plots are allocated to individual settlers. The former pattern of organisation might, it has been suggested, develop into a more formal settlement scheme with group or share participation but preserving the estate pattern of management.

The following criteria have been used as a basis for establishing the cropping patterns, settlement configuration and employment potential of the sub-scheme proposed for development in this Report;

(a) schemes would have not less than two and preferably three tree crops;

(b) workers would be accommodated in a central village with sub-schemes being located at a distance which would be within half an hour's travel by vehicle. Accommodation provided on a high density settlement basis with one-third acre house plots;

(c) the number of workers/settlers employed would be related to the labour requirements of the crops planted which for this exercise have been taken as follows:-

oil palm	one worker per 11 acres
rubber	one worker per 6 acres
cocoa	one worker per 10 acres

Allowance has been also made for part time employment on oil palm and rubber as follows:-

oil palm	35 per cent
rubber	15 per cent

The numbers of workers employed and the possible number of families calculated on this basis would be as follows:-

Sub-scheme	No. of workers required	No. of families accommodated
Igang	356	220
Sawai	372	222
Jatan	657	403
Total	1 385	845

(d) workers would receive wages at the current rate of $5.00 per day but the eventual minimum target income per worker family should be $2 500 per annum.

12.4.2 Revenues and Costs

The basis for estimating the costs of developing and operating the crops involved in these schemes are given in Part IV, housing costs are dealt with in Supporting Report No. 8.

Overall budgets have been calculated for each sub-scheme on the basis of an estate operation and these are summarised in Table 12.10. Details are given in Appendix III and depicted graphically in Figure 12.6.

TABLE 12.10 SUMMARY OF SLDB SUB-SCHEME BUDGETS $ THOUSAND

Sub-scheme	Detail	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Igang	Net sales revenue				155	1081	1809	2261	2561	2666	2721	2723	2736	2725	2714	2676
	Capital costs	396	1173	578	587			22								
	Net scheme income	-470	-2159	-1311	-1366	-294	+192	+619	814	892	962	952	961	944	936	905
	Operating costs	74	986	733	934	1375	1617	1620	1747	1774	1759	1771	1775	1781	1778	1771
Sawai	Net slaes revenue						116	906	1543	1964	2299	2461	2581	2629	2653	2660
	Capital costs			386	1204	570	570			37						
	Net scheme income			-458	-2169	-1335	-1302	-245	-67	+436	+635	730	850	880	896	888
	Operating costs			72	965	765	911	1151	1476	1491	1664	1731	1731	1749	1757	1772
Jatan	Net sales revenue								229	1756	2986	3814	4397	4671	4851	4909
	Capital costs					709	2186	1046	1018			44				
	Net scheme income					-842	-3884	-2446	-2503	-679	+117	+871	1255	1466	1661	1699
	Operating costs					133	1698	1400	1714	2435	2869	2899	3142	3205	3190	3210

TABLE 12.10 (cont'd)

Sub-scheme	Detail	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Igang	Net sales revenue	2648	2594	2566	2511	2457	2457	2429	2429	2401	2401	2373				
	Capital costs															
	Net scheme income	882	842	780	738	697	697	675	675	654	654	633				
	Operating costs	1766	1752	1786	1773	1760	1760	1754	1754	1747	1747	1740				
Sawai	Net sales revenue	2667	2652	2631	2585	2563	2519	2475	2475	2452	2452	2430	2430	2408		
	Capital costs															
	Net scheme income	891	878	861	827	774	743	710	710	692	692	675	675	659		
	Operating costs	1776	1774	1770	1758	1789	1776	1765	1765	1760	1760	1755	1755	1749		
Jatan	Net sales revenue	4937	4928	4917	4804	4818	4729	4682	4592	4502	4502	4456	4456	4411	4411	4366
	Capital costs															
	Net scheme income	1718	1695	1685	1643	1606	1540	1432	1369	1300	1300	1265	1265	1231	1231	1196
	Operating costs	3219	3233	3232	3221	3212	3189	3250	3223	3202	3202	3191	3191	3180	3180	3170

12.4.21 Revenues

The gross revenue for each crop has been taken as the value of production at the market or fob prices derived in Part IV. Net sales revenues has been calculated by deducting the export duties payable on rubber and palm oil from the fob values.

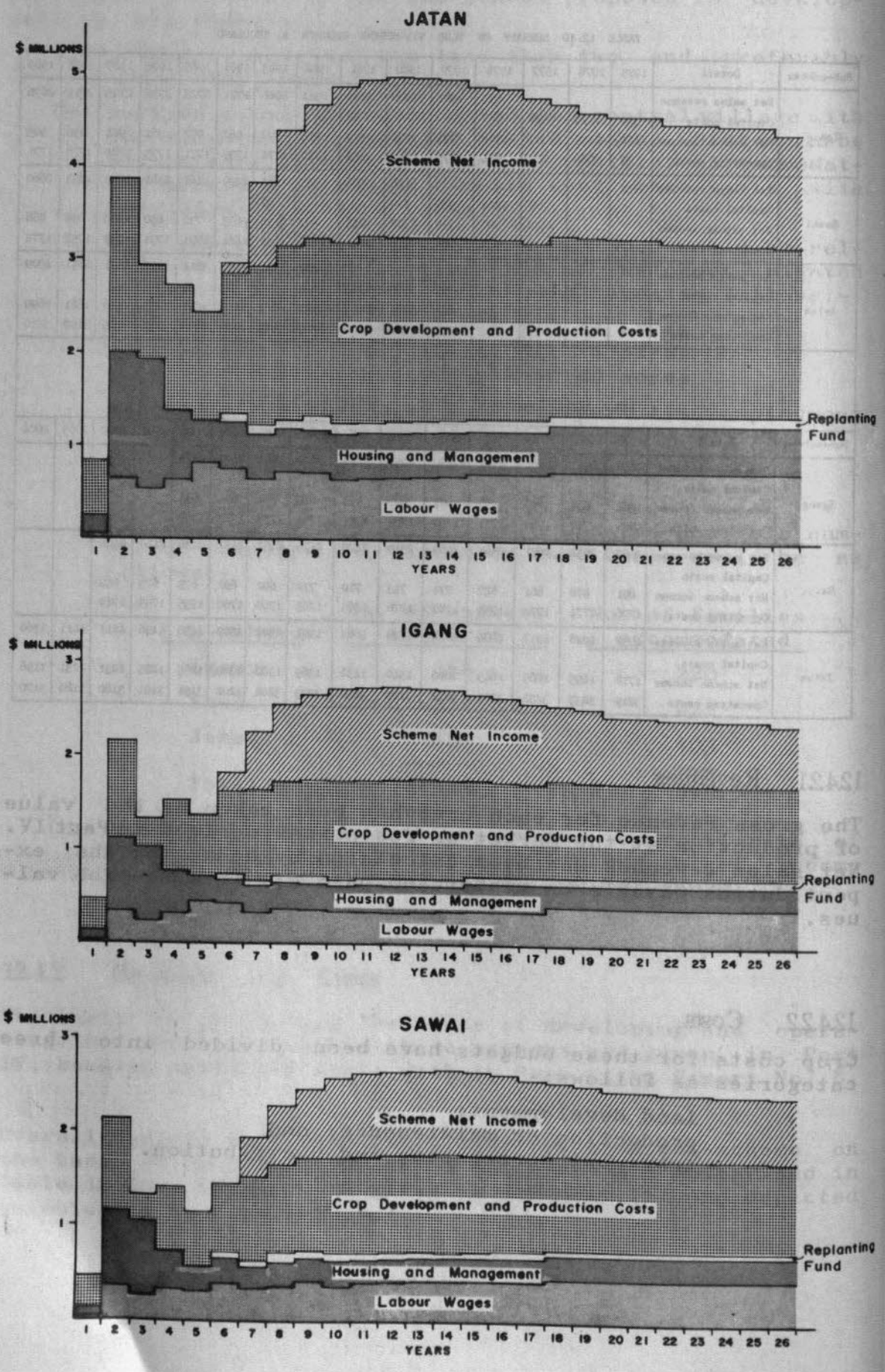
12.4.2.2 Costs

Crop costs for these budgets have been divided into three categories as follows:-

land development;
production or maintenance; and
transport, processing and distribution.

FIGURE 12.6

SLDB SUB SCHEME BUDGETS



All costs include labour at a basic wage of $5 per man day.

Land Development Costs

The items covered here have been land clearing, drainage and road construction for the area developed to each crop. Some items, particularly clearing, would be carried out by contractors but the SLDB would probably carry out its own road building, and drainage programmes with specialised teams or units. Maintenance costs for roads and drains have been included for the post-construction years. A summary of the initial land development costs for each crop is given by schemes in Table 12.11.

TABLE 12.11 LAND DEVELOPMENT COSTS ON SLDB SUB-SCHEMES ($ THOUSAND)

Crop	Igang	Sawai	Jatan	Total cost per crop
Oil palm	1 292	1 043	2 118	4 453
Rubber	112	191	228	531
Cocoa	-	106	177	283
Scheme total	1 404	1 340	2 523	5 267
Average cost dollars per acre	388	379	387	385

Production Costs

The costs of planting and maintaining crops have been included under this heading; materials and labour components in these operations have been calculated separately on the following basis:-

(a) costs of materials cover the following items for each crop:-

Planting: cover crops, shade, nurseries and planting materials.

Maintenance: fertilisers, herbicides, disease and pest control, tools and equipment.

(b) labour costs on the basis of the estimated labour input requirements for each crop costed at $5 per man day.

The average level of these costs for all three sub-schemes at full production would be as follows:-

	Total ($ thousand)	Average cost ($ per acre)
Materials	1 460	107
Labour	1 486	109
Total cost	2 946	216

Transport, Processing and Distribution

These costs would be basically the same as those which have been included under ex-farm costs in the small-holder budgets and they have been included here at the rates given in Table 12.3.

The total costs of these items for all three sub-schemes during the years of peak crop production would be as follows:-

	Thousand dollars		
	1985	1990	1995
Igang	637	602	563
Sawai	546	585	548
Jatan	859	1 104	1 049
Total	2 042	2 291	2 160

12.4.2.3 Management

Management costs have been calculated for the crops established on each scheme using the average rates per acre derived in Part IV. Capital and recurrent costs for each sub-scheme are summarised in Table 12.12.

TABLE 12.12 MANAGEMENT COSTS ON SLDB SUB-SCHEMES (THOUSAND DOLLARS)

Category	Igang	Sawai	Jatan	Total
Capital	388	384	706	1 478
Annual recurrent costs at full development	191	189	348	728

12.4.2.4 Housing

Provision has been made to house the number of workers families estimated in Section 12.4.1 in the central village assuming a house construction cost of $4 500 per family. The total costs for each scheme have been calculated assuming that a two year construction period would be required.

Maintenance costs have been estimated at two per cent of construction costs. A summary of the housing costs is given in Table 12.13.

TABLE 12.13 HOUSING COSTS FOR SLDB SUB-SCHEMES (THOUSAND DOLLARS)

Category	Igang	Sawai	Jatan	Total
House construction	990	1 000	1 814	3 804
Maintenance per annum	20	20	36	76

12.4.2.5 Replanting Fund Levy

Provision has been made to cover the costs of replanting tree crops by establishing funds for this purpose during the productive life of each crop on a basis similar to that proposed for small-holders (see Section 12.3.2.7). The costs calculated on this basis are given in Table 12.14.

TABLE 12.14 REPLANTING FUND COSTS FOR SLDB SCHEMES

Crop	Replanting costs discounted to clearing year	Productive life	Annual cost
	$ per acre	Years	$ per acre
Oil palm	759	21	16.9
Rubber	1 287	18	37.9
Cocoa	1 230	21	27.4

12.4.2.6 Worker Transport

Provision has been made in the analysis for transporting workers from the central village to their place of work at 60 cents per man day of labour input. The cost of providing this service has been estimated on the basis that the average distance travelled would be ten miles per day, that is five miles return trip, at a cost of six cents per passenger mile. The total annual cost when the crops are fully developed, would be $178 000 made up as follows:-

Scheme	Cost ($ thousand)	Average cost per acre per annum $
Igang	44	12
Sawai	50	14
Jatan	84	13
Total	178	13

12.4.3 Labour Requirements and Employment

It has been assumed that the labour requirement for tree crops on the SLDB sub-schemes would be the same as for the smallholder sub-schemes (see Section 12.3.3). The annual labour input requirements for crop production on each of the SLDB sub-schemes is summarised in Table 12.15. The Table also shows the maximum number of workers available assuming that the number of families accommodated on each sub-schemes would be as given in Section 12.4.1 and assuming that the worker families have the average composition given in Supporting Report No. 5. This comparison is shown diagrammatically in Figure 12.7.

TABLE 12.15 LABOUR REQUIREMENTS AND EMPLOYMENT ON SLDB SUB-SCHEMES

Sub-scheme	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Labour requirements (man-year equivalents) per year																					
Igang	63	256	175	238	315	305	252	273	266	245	249	249	256	256	256	256	256	284	284	284	284
Sawai			46	262	206	241	224	261	238	277	291	275	263	284	290	291	204	294	294	315	315
Jatan					96	462	362	448	564	543	458	505	505	469	479	481	488	489	492	492	492
Total requirement	63	256	221	500	617	1 008	838	1 002	1 068	1 065	998	1 029	1 044	1 009	1 025	1 028	1 038	1 067	1 070	1 091	1 091
Labour available(1) (full time worker equivalent)																					
Igang (220 families)			352				396					440					396				
Sawai (222 families)					355				400					444					400		
Jatan (403 families)							644				725					806					725
Total available	-	-	352	352	707	707	1 395	1 395	1 440	1 440	1 521	1 565	1 565	1 609	1 609	1 690	1 646	1 646	1 602	1 602	1 521

Note (1) Assumed labour available per family:-
At entry : 1.6 full time worker equivalents
After 5 years: 1.8 full time worker equivalents
After 10 years: 2.0 full time worker equivalents
After 15 years: 1.8 full time worker equivalents

The data indicate that in all except the initial years of new crop establishment there would be sufficient labour available for all crop production operations. The deficits occur due to planting operations which would be undertaken before permanent worker housing had been constructed. These operations would probably be undertaken by contractors who would employ and house the necessary workers.

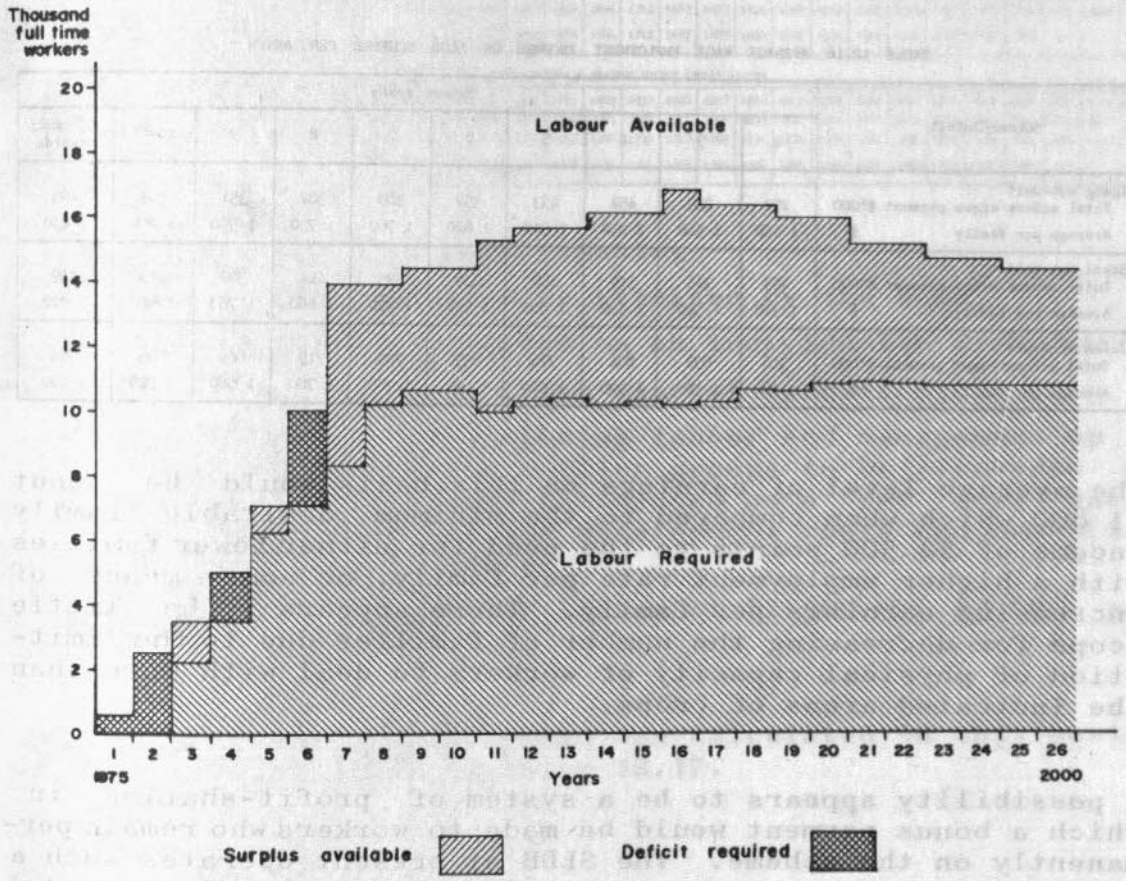
12.4.4 Incomes and Repayment Capacity

These analysis have been conducted to show:-

(a) the incomes workers would receive from wage employment on the schemes;

FIGURE 12.7

MANPOWER BALANCE ON SLDB SCHEMES



(b) the potential incomes of the schemes if they were organised on a group participation basis; and

(c) the capacity of the schemes to pay back the development costs involved in their establishment under normal wage employment and if profit-sharing were introduced.

12.4.4.1 Wage Employment Incomes

The main assumption relating to incomes derived from wage employment was that workers and their families accommodated on the scheme would benefit equally from the employment provided by the crops on the scheme. The actual number of workers employed at any time would vary according to the work load generated by the crops. There are likely to be seasonal labour peaks in oil palm cultivation largely due to seasonal fruiting. Similar yield peaks occur in rubber production. Some workers would therefore be seasonally employed as was indicated in Section 12.4.1.

The average earnings per family, calculated from the annual expenditures on labour wages for crop production, are given in Table 12.16.

TABLE 12.16 AVERAGE WAGE EMPLOYMENT INCOMES ON SLDB SCHEMES PER ANNUM

Scheme/Detail	Scheme years									
	2	3	4	5	6	7	8	9	10-16	17 and onwards
Igang sub-unit										
Total scheme wages payment $'000	252	339	452	433	357	389	382	351	363	403
Average per family $	1 140	1 540	2 050	1 960	1 620	1 760	1 730	1 590	1 650	1 830
Sawai sub-unit										
Total scheme wages payment $'000	293	344	319	400	339	395	414	392	413	449
Average per family $	1 310	1 540	1 430	1 800	1 520	1 770	1 860	1 760	1 860	2 020
Jatan sub-unit										
Total scheme wages payment $'000	516	639	804	774	653	720	719	669	695	762
Average per family $	1 280	1 580	1 990	1 920	1 620	1 780	1 780	1 660	1 720	1 890

The average level of earnings on this basis would be about $1 800 which when compared to the minimum desirable family income of $2 500 points to the need for either fewer families with a higher employment rate per family, or some means of increasing earnings per family. There appears to be little scope for decreasing the number of families due to the limitation of physical capacity of workers to deal with more than the indicated areas of crops.

A possibility appears to be a system of profit-sharing in which a bonus payment would be made to workers who remain permanently on the scheme. The SLDB at present operates such a scheme whereby workers receive a $1 per day bonus provided they work more than 20 days per month on the scheme. If a similar bonus was applied to the above earnings the average family income would increase to about $2 160. If the value of housing which would be provided at no cost, is taken into account the total income would be $2 485. The basis of this calculation is given in Section 12.3.2.3 where the annual equivalent value of the house construction cost is shown to be $235 and repair costs $90 per annum. In addition water and other services would be provided free. A budget for Jatan sub-scheme calculated on this basis is given in Table 12.17. It appears that such an arrangement would provide satisfactory incomes for workers.

12.4.2 Incomes Under Group Participation

As an alternative to the employment of workers as wage-earners the schemes might be organised as group participation settlement schemes. The basis for setting up such schemes might be as follows:-

- settlers to participate in groups with 20 to 30 members;
- scheme crop areas to be divided amongst groups according

TABLE 12.17 SUMMARY OF JATAN SUB-SCHEME BUDGETS UNDER ALTERNATIVE SETTLEMENT SYSTEMS

Years	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
(A) Profit sharing scheme - $6.00 per day wages																									
Net sales revenue	-	-	-	229	1756	2986	3814	4397	4671	4851	4909	4937	4928	4917	4864	4818	4729	4682	4592	4502	4502	4456	4456	4411	4411
Total costs		4016	2549	2860	2596	2922	2972	3184	3218	3193	3215	3225	3241	3240	3230	3221	3198	3271	3244	3223	3223	3212	3212	3201	3201
Net scheme income	-851	-4016	-2549	-2631	-840	+64	+842	1213	1453	1658	1694	1712	1687	1677	1634	1597	1531	1411	1348	1279	1279	1244	1244	1210	1210
Repayment of development costs	-	-	-	-	-	64	842	1213	1453	1658	1694	1712	1687	1677	1634	1597	1531	1411	1348	1279	1279	706	-	-	-
(B) Group participation scheme - maximum worker family income																									
Net sales revenue	-	-	-	229	1756	2986	3814	4397	4671	4851	4909	4937	4928	4917	4864	4818	4728	4682	4592	4502	4502	4456	4456	4411	4411
Total costs	842	2977	1829	2863	2401	3067	3262	3494	3558	3694	3701	3707	3711	3708	3693	3684	3661	3761	3634	3613	3613	3602	3602	3591	3591
Net scheme income	-842	-2977	-1829	-2634	-645	-81	+552	903	1113	1157	1208	1230	1217	1209	1171	1134	1068	921	958	889	889	854	854	820	820
Repayment of development costs	-	-	-	-	-	+21	+654	1005	1244	1288	1339	1361	1348	1340	1302	1265	1199	1052	1089	1020	1020	985	317	-	-

to the number of participants;

- overall management to be retained by the SLDB;
- house ownership provided on an individual or group basis;
- groups organised in fifth year of operation;
- development costs including labour and management up to the formation of the settler groups to be recovered by a consolidated charge calculated on a per acre basis aimed at recovering the development costs and funded interest within 20 years;
- settlers to receive an income of $2 500 to $3 000 per annum per family.

As an example Jatan sub-scheme was calculated on this basis. The results are given in Table 12.17.

12.4.4.3 Repayment Capacity

Calculations are presented in Appendix III. The repayment capacity of the schemes employing workers on a wage-earning basis was examined first. For this analysis the pay-back periods were calculated for each sub-scheme charging interest at seven per cent per annum. The introduction of profit sharing on the basis of $1 per day bonus on wages, and group participation including and excluding house costs were examined for the Jatan sub-scheme.

The results of the calculations are summarised in Table 12.18 and the following comments are made:-

(a) In all cases if wages only were paid to workers (at $5 per day) the pay-back period of the schemes would be close to or less than the 20 years considered desirable. However family incomes would not be satisfactory under this system.

(b) Under a profit-sharing system it would be feasible to pay a bonus of between $1 and $2 per day in addition to the basic $5 wage rate. This would raise family earnings to a satisfactory level; the pay-back period would be within the productive life of the crop.

TABLE 12.18 REPAYMENT CAPACITIES OF SLDB SUB-SCHEMES

Organisation system	Sub-scheme	Accumulated deficit including interest	Pay-back period from clearing year
		$ mn	Years
Workers earning wages at $5	Igang	7.256	17
	Sawai	7.480	20
	Jatan	13.659	19
Profit-sharing:			
(a) Bonus $1	Jatan	14.473	21
(b) Bonus $2	Jatan	15.501	+25
Group participation:			
(a) Including housing	Jatan	15.734	+25
(b) Excluding housing	Jatan	11.902	22

(c) A group or share participation scheme would appear to provide the most acceptable alternative since potential family earnings would be higher and repayment capacity satisfactory. Also participants would have the opportunity of becoming responsible for management of sub-units or blocks within the schemes.

CHAPTER 13

ECONOMIC ANALYSIS OF THE AGRICULTURAL PLAN

13.1 INTRODUCTION

The object of the present analysis is to assess the viability of the investment packages in the agricultural plan and their contribution to the overall economic benefit of Sarawak. In this Chapter the Public Sector Settlement schemes proposed for the Niah-Suai and Lambir-Subis RDAs, the Road-Based Improvement Programme and the Private Investor Development Schemes are examined. The analysis of the Karabungan Beef Cattle Ranch is presented in Part IV.

The bases for the economic analysis are the income and expenditure streams shown in Appendix IV. The net cash flows derived from these streams have been discounted to present value at varying rates of discount to indicate the internal rates of return to the proposals; and the financial analysis of the schemes is used to indicate their pay-back periods consistent with reasonable levels of income for small-holders or subsistence farmers.

The economic life of the agricultural projects is taken as 25 years after which time replanting of the major tree crops would be necessary. As is usual in this type of analysis it has been necessary to distinguish between the commercial or market value and the social value of the scheme, thus:-

- the commercial evaluation examines the schemes from an investor's point of view, whether this be the Government, SLDB or a private commercial concern. For this analysis all costs and revenues are calculated at actual market values;
- the social evaluation of the schemes measures the return to individual factors of production, where market imperfections and internal transfer payments have been eliminated. Inputs and outputs are valued, where possible, at their opportunity cost, the object being to measure the social economic returns to the schemes.

An analysis of foreign exchange flows for the Public Sector Settlement Schemes aims to show the net balance of foreign exchange flows attributable directly to these schemes either in the form of imports, exports or import substitutes.

The last sections of the analyses deal with the financing requirements and overall cash flow of the statutory body or other agency providing funds for the proposed developments.

13.2 PUBLIC SECTOR SETTLEMENT SCHEMES

13.2.1 Physical Basis for the Analysis

The schemes examined here are those developed during the action programme period 1975 to 1980. There are five Small-Holders (SMH) sub-schemes totalling 21 085 crop acres within the Niah-Suai RDA and one of 3 080 crop acres in the Lambir-Subis RDA. The SLDB public estate in the Niah-Suai RDA consists of three sub-schemes totalling 13 690 crop acres. The cropping pattern and land clearance rates of the programme are summarised in Table 13.1.

TABLE 13.1 CROPPING PATTERN PHASING AND TYPE OF PUBLIC SECTOR SETTLEMENT SCHEMES

Year	Oil palm		Rubber		Cocoa		Rice		House plot
	SLDB	SMH	SLDB	SMH	SLDB	SMH	SLDB	SMH	SMH
1974	-	1 890	-	875	-	120	-	195	194
1975	3 245	-	370	-	-	-	-	-	-
1976	-	3 945	-	1 415	-	875	-	425	427
1977	2 620	2 555	645	-	270	510	-	330	331
1978	-	4 035	-	2 530	-	-	-	300	318
1979	5 320	660	770	-	450	-	-	-	-
1980	-	1 795	-	1 370	-	160	-	180	268
Total	11 185	14 880	1 785	6 190	720	1 665	-	1 430	1 538

Note SLDB = SLDB Public Estate
SMH = Small-Holder Settlement

The pattern of development already described requires SLDB to be responsible for the physical development of the whole area and its maintenance to the fifth year when the small-holder areas would become the responsibility of the ADU. SLDB would also set up crop processing facilities. Details of the facilities estimated to be required are given in Appendix II. All oil palm and rubber installations would remain under SLDB control, but some cocoa dryers would be operated by farmer groups. An oil palm mill would be required at Igang in the Niah-Suai RDA in 1979. It is planned to have an initial capacity of 30 tons per hour, late in 1982 it would be extended to 60 tons per hour to provide for the full needs of the development in that RDA. Rubber processing requirements are assumed to be met by a 20 ton per day unit constructed in two phases of 10 tons per day in 1982 and 1985 respectively. This too would be built at Igang.

13.2.2 Costs

The main costs of land development, crop maintenance, housing, management and processing are summarised in Table 13.2 and details are given in Appendix IV. The components of these costs are as follows:-

TABLE 13.2 SUMMARY OF PUBLIC SECTOR SETTLEMENT SCHEMES COSTS $ THOUSAND

Year	Farm Costs (materials)		Labour Costs		Project Costs			Total Costs	
	Land development	Crop production	At $3 per man day	At $5 per man day	Housing	Management	Processing	With labour at $3	With labour at $5
1974	204	-	63	104	91	94	-	452	493
1975	712	314	347	577	962	333	-	2 668	2 898
1976	999	635	608	1 013	717	650	-	3 609	4 014
1977	1 813	1 160	1 054	1 757	2 379	1 250	-	7 656	8 359
1978	2 174	1 832	1 552	2 585	2 054	1 588	5 989	15 189	16 222
1979	2 322	2 652	2 124	3 539	1 868	2 124	1 071	12 161	13 576
1980	2 423	3 509	2 421	4 034	1 077	2 204	1 255	12 889	14 502
1981	1 508	4 090	2 288	3 814	2 121	2 234	2 357	14 598	16 124
1982	1 466	4 568	2 889	4 813	199	1 974	5 347	16 443	18 367
1983	969	5 214	2 583	4 303	199	1 747	2 635	13 347	15 067
1984	876	5 628	2 570	4 283	199	1 733	2 768	13 774	15 487
1985	794	5 971	2 584	4 307	199	1 577	2 841	13 966	15 689
1986	832	6 071	2 670	4 450	199	1 578	3 331	14 681	16 461
1987	764	6 184	2 739	4 564	199	1 580	3 012	14 478	16 303
1988	764	6 205	2 792	4 654	199	1 575	3 040	14 575	16 437
1989	764	6 217	2 624	4 375	199	1 578	3 060	14 442	16 193
1990	764	6 237	2 853	4 754	199	1 578	3 073	14 704	16 605
1991	764	6 230	2 880	4 801	199	1 579	3 078	14 730	16 651
1992	764	6 224	2 923	4 870	199	1 585	3 079	14 774	16 721
1993	764	6 202	2 955	4 925	199	1 585	3 071	14 776	16 746
1994	764	6 173	2 995	4 991	199	1 589	3 063	14 783	16 779
1995	764	6 132	3 023	5 038	199	1 589	3 054	14 761	16 776
1996	764	6 109	3 064	5 107	199	1 596	3 046	14 778	16 821
1997	764	6 083	3 077	5 128	199	1 596	3 042	14 761	16 812
1998	764	6 061	3 077	5 129	199	1 596	3 035	14 732	16 784

(a) land development, which includes land clearing, drainage and stream clearing and construction of the road network required to serve the area;

(b) crop production costs, which cover all materials and labour inputs concerned with planting, establishing, maintaining and harvesting the crop;

(c) labour costs, which throughout the analysis have been assumed to have an opportunity cost of $3 per day. However a sensitivity analysis is also carried out on a $5 per day costing. In the financial analysis wages on the SLDB areas have been costed at $5 per man day, but on small-holder areas labour costs have been assessed on a family income basis as follows:-

Year	Income allowed excluding house plot $
Clearing year	zero
1	1 300
2	1 500
3	1 750
4	2 000
5 onwards	2 500

(d) transport and distribution costs, which include loading and transport of the crop from farm gate to processing centre, and thereafter the distribution and

port handling costs of the processed products. Throughout the analysis Bintulu is assumed to be the port of shipment;

(e) processing costs, the following costs for processing have been assumed in the analysis:-

Oil palm: The estimated capital, operating and management costs of the Igang Oil Palm mill have been used for the Niah-Suai area while a cost of $12 per ton ffb has been included for small-holder production from the Mera-a sub-scheme.

Rubber: Latex has been assumed to be processed in the crumb rubber factory at Igang to produce high grade SMR for the Niah-Suai RDA and the actual estimated capital and operating costs of this factory have been included. For Mera-a processing costs have been calculated at 6.25 cents per pound of rubber produced.

Cocoa: Fermentation and drying have been assumed to be carried out in Samoan type units operated on a group user basis at a cost of 3.5 cents per pound of dried bean equivalent (dbe).

(f) management costs, which cover the SLDB and ADU organisations including the capital and recurrent costs of buildings, salaries, vehicles and general administration. Worker transport costs have been included at 60 cents per man day of labour input on the SLDB schemes where a control village is planned, and from which workers would be transported daily to their place of work;

(g) housing costs, which cover the capital and maintenance costs of housing for the estimated number of settler or worker families accommodated on a scheme at $4 500 per housing unit. Land clearing costs of the village areas have been assumed at $250 per acre.

13.2.3 Revenues

In the analysis the revenues from the proposed development scheme are made up of the value of the crops produced at their projected fob market prices which are given in Part IV less the appropriate selling commission and export duty, and net revenue derived from the forestry operation. Summaries of crop production and revenues are given in Tables 13.3 and 13.4 and details are given in Appendix IV. The agricultural revenue stream is calculated directly from the build-up of crop production which in turn depends on the phasing of planting. Forestry revenues are assessed on the basis of estimated yields less extraction costs, as described in Supporting Report No. 3. On small-holder scheme areas homestead plot production, most of which would be consumed by the family, is assessed on the basis of the net production values given in Chapter 12.

Once all the tree crops are in full production, around 1991, the gross revenue of the development would be about $28 mn,

export duty would account for $2 mn of this total.

TABLE 13.3 SUMMARY OF CROP PRODUCTION FROM PUBLIC SECTOR SETTLEMENTS (TONS)

Year	Palm oil	Palm kernels	Rubber	Cocoa	Rice
			drc	dbe	
1975	-	-	-	-	-
1976	-	-	-	-	-
1977	-	-	-	-	152
1978	189	38	-	-	174
1979	1 685	311	-	26	540
1980	5 037	935	-	54	875
1981	10 227	1 949	-	273	1 222
1982	17 151	3 309	245	646	1 383
1983	24 732	4 822	497	1 018	1 630
1984	33 194	6 502	1 053	1 288	1 698
1985	39 781	7 848	1 576	1 427	1 730
1986	43 706	8 718	2 610	1 563	1 759
1987	45 648	9 133	3 476	1 598	1 759
1988	46 352	9 268	4 429	1 598	
1989	46 480	9 294	5 060		
1990	46 202	9 240	5 477		
1991	45 719	9 130	5 793		
1992	45 066	9 006	6 031		
1993	44 347	8 847	6 226		
1994	43 500	8 666	6 325		
1995	42 756	8 536	6 380		
1996	41 998	8 385	6 380		
1997	41 373	8 275			
1998	40 820	8 156			
1999	40 341	8 046			

13.2.4 Economic and Financial Analysis

13.2.4.1 Economic Evaluation at Market Prices

The net cash flow for the proposed development is shown in Table 13.5 and depicted in Figure 13.1. The Table shows that the investment period, that is when costs exceed revenues, would extend over nine years (up to 1982) and the accumulated cash flow deficits would amount to $56.3 mn. The annual cash surplus would rise to $11.2 mn in 1990 and 1991 but would decline to $9.6 mn by 1998 due to decreasing oil palm yields and prices towards the end of the plan period. In Appendix IV net cash flows are computed to show the effect of higher palm oil and rubber prices of including and excluding export duties.

The commercial rate of return to investment in the proposed development, at basic prices and excluding duty, would be 8.5 per cent; while if rubber and palm oil prices rise 20 per

TABLE 13.4 SUMMARY OF CROP REVENUES FROM PUBLIC SECTOR SETTLEMENTS $ THOUSAND

Year	At social prices			At market prices					
	Gross f.o.b. revenue	Forestry revenue	Total project revenue	Gross sales revenue	Export duty	Net revenue	Forestry revenue	Total project revenue excluding duty	Total project revenue including duty
1974	-	356	356	-	-	-	356	356	356
1975	-	441	441	-	-	-	441	441	441
1976	68	772	840	68	-	68	772	840	840
1977	175	787	962	168	8	160	787	947	955
1978	1 125	780	1 905	1 067	65	1 002	780	1 782	1 847
1979	2 907	1 389	4 296	2 741	188	2 553	1 389	3 942	4 130
1980	5 810	2 629	8 439	5 482	376	5 106	2 629	7 735	8 111
1981	9 813	-	9 813	9 250	644	8 606	-	8 606	9 250
1982	14 053	-	14 053	13 232	921	12 311	-	12 311	13 232
1983	18 735	-	18 735	17 643	1 252	16 391	-	16 391	17 643
1984	22 373	-	22 373	21 045	1 512	19 533	-	19 533	21 045
1985	25 479	-	25 479	23 967	1 735	22 232	-	22 232	23 967
1986	27 386	-	27 386	25 763	1 874	23 889	-	23 889	25 763
1987	28 751	-	28 751	27 049	1 977	25 072	-	25 072	27 049
1988	29 502	-	29 502	27 758	2 033	25 725	-	25 725	27 758
1989	29 834	-	29 834	28 073	2 057	26 016	-	16 016	28 073
1990	29 959	-	29 959	28 194	2 066	26 128	-	26 128	28 194
1991	29 924	-	29 924	28 165	2 063	26 102	-	26 102	28 165
1992	29 807	-	29 807	28 058	2 054	26 004	-	26 004	28 058
1993	29 527	-	29 527	27 799	2 032	25 767	-	25 767	27 799
1994	29 254	-	29 254	27 546	2 011	25 535	-	25 535	27 546
1995	28 910	-	28 910	27 225	1 985	25 240	-	25 240	27 225
1996	28 630	-	28 630	26 965	1 963	25 002	-	25 002	26 965
1997	28 376	-	28 376	26 728	1 944	24 784	-	24 784	26 728
1998	28 154	-	28 154	26 521	1 927	24 594	-	24 594	26 521

cent a return of 13.2 per cent would be achieved. The probable return to the schemes lies between these two rates. If export duty were not payable the returns would be 11.1 and 15.1 per cent respectively at basic prices. These returns are regarded as satisfactory for commercial investment where a real interest rate of seven to eight per cent net of inflation might be expected.

13.2.4.2 Economic Evaluation at Social Prices

The net cash flows at social prices are summarised in Table 13.6. Details are given in Appendix IV. Briefly the main items of costs and returns which differ from the market price evaluation are:-

- labour costs which are valued at the shadow wage of $3 per man day to reflect productivity in traditional agricultural employment;
- production costs which are valued at fob prices for exported crops and net retail value for products consumed or sold locally.

The internal rates of return (IRR) and net present values

TABLE 13.5 PUBLIC SECTOR SETTLEMENTS CASH FLOW AT MARKET PRICES $ THOUSAND

Year	Revenue		Costs labour @ $5	Net cash flow	
	Crops excluding duty	Forestry net revenue		including forestry	excluding forestry
1974	-	356	750	- 394	- 750
1975	-	441	2 840	- 2 399	- 2 840
1976	68	772	5 052	- 4 212	- 4 984
1977	168	787	7 963	- 7 008	- 7 795
1978	1 067	780	16 728	-14 881	-15 661
1979	2 741	1 389	12 745	- 8 615	-10 004
1980	5 482	2 629	14 957	- 6 846	- 9 475
1981	9 254	-	16 168	- 6 914	- 6 914
1982	13 232	-	18 246	- 5 014	- 5 014
1983	17 643	-	15 674	+ 1 969	+ 1 969
1984	21 045	-	16 100	+ 4 945	+ 4 945
1985	23 967	-	16 510	+ 7 457	+ 7 457
1986	25 763	-	17 043	+ 8 720	+ 8 720
1987	27 049	-	16 850	+10 199	+10 199
1988	27 758	-	16 847	+10 911	+10 911
1989	28 073	-	16 906	+11 167	+11 167
1990	28 194	-	16 943	+11 251	+11 251
1991	28 165	-	16 956	+11 209	+11 209
1992	28 058	-	16 995	+11 063	+11 063
1993	27 799	-	16 970	+10 829	+10 829
1994	27 546	-	16 967	+10 579	+10 579
1995	27 225	-	16 917	+10 308	+10 308
1996	26 965	-	16 955	+10 010	+10 010
1997	26 728	-	16 925	+ 9 803	+ 9 803
1998	26 521	-	16 896	+ 9 625	+ 9 625

FIGURE 13.1

PUBLIC SECTOR SETTLEMENTS CASH FLOW AT MARKET PRICES

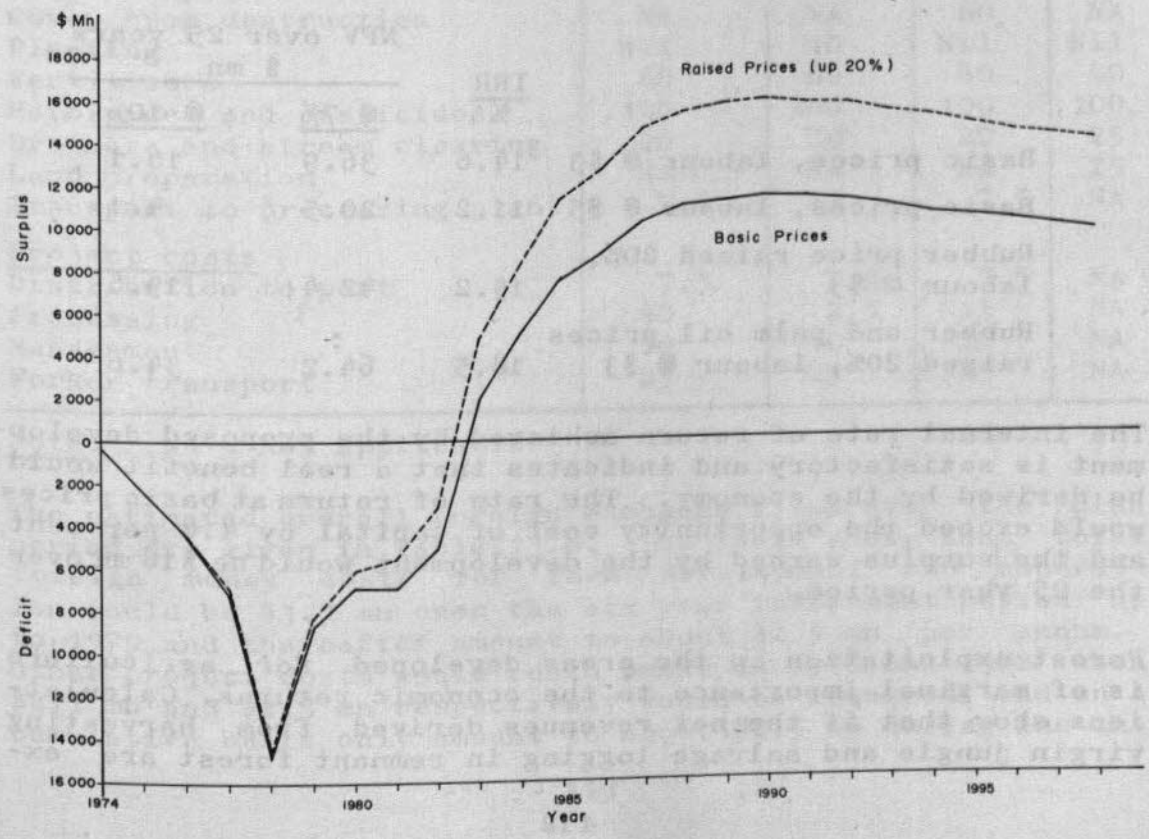


TABLE 13.6 PUBLIC SECTOR SETTLEMENT SCHEMES CASH FLOW AT SOCIAL PRICES $ THOUSAND

Year	Revenue		Costs labour @ $3	Net cash flow	
	Crops f.o.b. prices	Forestry net revenue		including forestry	excluding forestry
1974	-	356	451	- 95	- 451
1975	-	441	2 667	- 2 226	- 2 667
1976	68	772	3 609	- 2 769	- 3 541
1977	175	787	7 656	- 6 694	- 7 481
1978	1 125	780	15 188	-13 283	-14 063
1979	2 907	1 389	12 160	- 7 864	- 9 253
1980	5 810	2 629	12 889	- 4 450	- 7 079
1981	9 813	-	14 598	- 4 785	- 4 785
1982	14 053	-	16 442	- 2 389	- 2 389
1983	18 735	-	13 346	+ 5 389	+ 5 389
1984	22 373	-	13 774	+ 8 599	+ 8 599
1985	25 479	-	13 967	+11 512	+11 512
1986	27 386	-	14 680	+12 706	+12 706
1987	28 751	-	14 478	+14 273	+14 273
1988	29 502	-	14 576	+14 926	+14 926
1989	29 834	-	14 443	+15 391	+15 391
1990	29 959	-	14 703	+15 256	+15 256
1991	29 924	-	14 731	+15 193	+15 193
1992	29 807	-	14 773	+15 034	+15 034
1993	29 527	-	14 775	+14 752	+14 752
1994	29 254	-	14 783	+14 471	+14 471
1995	28 910	-	14 761	+14 149	+14 149
1996	28 630	-	14 778	+13 852	+13 852
1997	28 376	-	14 761	+13 615	+13 615
1998	28 154	-	14 732	+13 422	+13 422

(NPV) of the development over 25 years would be as follows:-

	IRR %	NPV over 25 years $ mn @ 7%	NPV over 25 years $ mn @ 10%
Basic prices, labour @ $3	14.6	36.9	16.1
Basic prices, labour @ $5	11.2	20.5	4.1
Rubber price raised 20%, labour @ $3	15.2	42.4	19.6
Rubber and palm oil prices raised 20%, labour @ $3	18.5	64.2	34.6

The internal rate of return achieved by the proposed development is satisfactory and indicates that a real benefit would be derived by the economy. The rate of return at basic prices would exceed the opportunity cost of capital by 4.6 per cent and the surplus earned by the development would be $16 mn over the 25 year period.

Forest exploitation in the areas developed for agriculture is of marginal importance to the economic returns. Calculations show that if the net revenues derived from harvesting virgin jungle and salvage logging in remnant forest are ex-

cluded the areas developed reduces the IRR by 1.7 per cent. However the NPV at 10 per cent would be reduced from $16.1 to $11.2 mn a 31 per cent reduction.

13.2.4.3 Foreign Exchange Analysis

The analysis of foreign exchange flows indicates the contribution to the nation's foreign exchange reserves that would result from the proposed development. In order to carry out the analysis it is necessary to estimate the foreign exchange components of various cost and revenue items. This is complicated by changing economic conditions, particularly rates of exchange and the development of local industry. However, Table 13.7 gives the estimated foreign exchange components of the various cost items assumed to apply to the proposed development. In the analysis the effect of production on foreign exchange flows has been assessed in terms of either the direct value of sales of produce or as a saving of foreign exchange where increased production would be likely to replace imports.

TABLE 13.7 ESTIMATED FOREIGN EXCHANGE CONTENT OF DEVELOPMENT, PRODUCTION, FARM AND PROJECT COSTS

Item/category	Oil palm	Rubber	Cocoa	Rice
	Percentage of total cost per item			
Farm costs				
Land clearing	20	15	15	25
Roads	10	10	10	NA
Cover crops	100	100	100	NA
Cover crop destruction	NA	NA	60	NA
Planting	Nil	10	Nil	Nil
Fertilisers	60	60	40	40
Herbicides and pesticides	100	100	100	100
Drainage and stream clearing	20	20	20	25
Land preparation	NA	NA	NA	25
Transport to processing plant	7.5	15	7.5	NA
Project costs				
Distribution to port	7.5	7.5	7.5	NA
Processing	40	2.5	Nil	NA
Management	10	10	10	NA
Worker transport	25	25	25	NA

Note: NA = Not applicable

The estimated overall foreign exchange flows over the plan period are given in Table 13.8. The Table shows that total foreign money costs for farm development and operation would be $3.3 mn over the six year investment period up to 1979 and thereafter amount to about $2.5 mn per annum. Other project costs would reach peaks in 1978 and 1982 when $2.1 mn and $2.3 mn respectively would be required, and on a cumulative basis only amount to about $2.5 mn during the in-

TABLE 13.8 PUBLIC SECTOR SETTLEMENT SCHEMES OVERALL FOREIGN EXCHANGE FLOWS $ THOUSAND

Year	Inflow derived from			Outflow to			Net contribution to foreign exchange reserves	
	Crops revenue	Forestry revenue	Sub-total	Farm costs	Other project costs	Sub-total	Including forestry	Excluding forestry
1974	-	356	356	88	28	116	+ 240	- 116
1975	-	441	441	251	70	321	+ 120	- 321
1976	48	772	820	600	102	702	+ 118	- 654
1977	157	787	944	980	165	1 145	- 201	- 988
1978	1 060	780	1 840	1 376	2 130	3 506	- 1 666	- 2 446
1979	2 844	1 389	4 233	1 766	771	2 537	1 696	347
1980	5 705	2 629	8 334	2 290	862	3 152	5 182	2 553
1981	9 729	-	9 729	2 351	967	3 318	6 411	6 411
1982	13 938	-	13 938	2 539	2 265	4 804	9 134	9 134
1983	18 665	-	18 665	2 528	1 301	3 829	14 836	14 836
1984	22 304	-	22 304	2 645	1 281	3 926	18 378	18 378
1985	25 447	-	25 447	2 591	1 274	3 865	21 582	21 582
1986	27 345	-	27 345	2 628	1 267	3 395	23 450	23 450
1987	28 717	-	28 717	2 587	1 197	3 784	24 933	24 933
1988	29 469	-	29 469	2 601	1 200	3 801	25 688	25 688
1989	29 798	-	29 798	2 603	1 199	3 802	25 996	25 996
1990	29 918	-	29 918	2 614	1 196	3 810	26 108	26 108
1991	29 878	-	29 878	2 613	1 193	3 806	26 072	26 072
1992	29 754	-	29 764	2 615	1 190	3 805	25 949	25 949
1993	29 466	-	29 466	2 609	1 178	3 787	25 679	25 679
1994	29 187	-	29 187	2 601	1 174	3 775	25 412	25 412
1995	28 835	-	28 835	2 596	1 169	3 765	25 070	25 070
1996	28 550	-	28 550	2 594	1 169	3 763	24 787	24 787
1997	28 291	-	28 291	2 592	1 164	3 756	24 535	24 535
1998	28 064	-	28 064	2 590	1 160	3 750	24 314	24 314

vestment period. Thereafter imports in this category are estimated to cost about $1.2 mn per annum.

Since most of the production is likely to be exported the direct foreign exchange inflow attributable to the development would be considerable. From 1984 onwards the value of exports together with the value of import substitutions would amount to $25 mn to $30 mn per annum at basic prices. After 1984 the net contribution to national foreign exchange reserves from these schemes is estimated to be $20 to $26 mn per annum at basic prices. At the previously assumed raised palm oil and rubber prices net annual earnings would be increased to about $30 mn.

132.4.4 Financial Analysis

The agricultural plan envisages the SLDB to be the main autonomous agency involved in development of the public sector schemes and in this Section the financial position of SLDB during the life of the project is examined. The functions of the SLDB and its relationship to the ADU and other Government Departments responsible for infrastructure development are described in Chapter 11, Part II of the Main Report and in Parts I and III of this Supporting Report.

The expenditure by the SLDB on the proposed development are derived from the costs given in the economic analysis at market prices given in Section 13.2.4.1 and detailed in Appendix IV. The main components of the Board's expenditure would be the following:-

- land development for all the areas allocated to it;
- crop production costs on all these areas to year five of development; and subsequently for areas retained under its control. The small-holder sub-schemes would become the responsibility of ADU in year six. It is assumed that for these areas annual subventions from Government would be made to cover these costs so that SLDB would carry no financial burden;
- management costs of staff and administration for all the areas during the initial development period and subsequently for the areas retained under its control. Worker transport for the SLDB estate areas is included under this heading. On the small-holder schemes it is assumed similar subvention arrangements would apply to these costs as for the crop production costs;
- housing costs for settlers on small-holder areas and workers on SLDB estate areas. Small-holder settler housing costs are assumed to be reimbursed by Government or other financing agency;
- processing facilities set up to handle oil palm and rubber for the whole area, and cocoa in those areas which remain under its direct control. Both capital and operating costs would have to be met by the Board who would impose a charge for the service to all users outside the area under its direct control. The assumed rates are given in Section 13.2.2.1.

A summary of estimated SLDB expenditure is given in Table 13.9. Details are given in Appendix IV. The greatest expenditures would occur during the period 1978 to 1982 when the palm oil mill and rubber factory in Igang would be established.

The income accruing to the SLDB would be derived from a number of sources which are summarised in Table 13.10 from details given in Appendix IV. The main revenue sources would be as follows:-

- subventions from Government or financing agencies to cover the development, housing and management costs of the areas destined to be divided into small-holdings;
- charges levied for processing and marketing of crops delivered to processing units;
- receipts from the sale of commodities produced on the area under SLDB management;
- receipts from replanting fund levies set up to cover replanting costs of the tree crops as described in Chapter 12.

Allowing for income from crops, the replanting fund levies,

TABLE 13.9 ESTIMATED SLDB EXPENDITURE $ THOUSAND

Year	SLDB schemes					Small-holder schemes					Factory Costs	Total Expenditure
	Land Development	Farm Production Costs	Housing and Village Clearing	Management	Sub-total	Land Development	Farm Production Costs	Housing and Village Clearing	Management	Sub-total		
1974	-	-	-	-	-	292	16	91	94	493	-	493
1975	338	28	186	103	655	589	689	776	230	2 284	-	2 939
1976	607	804	495	250	2 156	718	514	222	400	1 854	-	4 010
1977	358	531	495	391	1 775	1 933	1 907	1 884	859	6 583	-	8 358
1978	1 041	1 412	520	708	3 681	1 673	2 436	1 534	831	6 474	5 978	16 133
1979	709	1 477	520	716	3 422	2 101	3 317	1 332	1 330	8 080	989	12 491
1980	1 595	3 038	947	1 120	6 700	1 160	3 465	213	890	5 728	1 117	13 545
1981	209	2 744	947	970	4 870	1 288	2 852	1 123	924	6 187	2 182	13 239
1982	919	3 103	76	1 191	5 289	284	2 102	46	291	2 723	5 120	13 132
1983	311	3 486	76	911	4 784	315	752	21	280	1 368	2 380	8 532
1984	278	3 747	76	909	5 010	82	745	21	185	1 033	2 495	8 538
1985	322	3 708	76	898	5 004	-	-	-	-	-	2 559	7 563
1986	283	3 848	76	903	5 110	-	-	-	-	-	3 045	8 155
1987	283	3 862	76	905	5 126	-	-	-	-	-	2 722	7 848
1988	283	3 830	76	900	5 089	-	-	-	-	-	2 747	7 836
1989	283	3 853	76	903	5 115	-	-	-	-	-	2 767	7 882
1990	283	3 856	76	903	5 118	-	-	-	-	-	2 782	7 900
1991	283	3 866	76	904	5 129	-	-	-	-	-	2 792	7 921
1992	283	3 898	76	910	5 167	-	-	-	-	-	2 796	7 963
1993	283	3 885	76	910	5 154	-	-	-	-	-	2 788	7 968
1994	283	3 907	76	914	5 180	-	-	-	-	-	2 779	7 942
1995	283	3 890	76	914	5 163	-	-	-	-	-	2 773	7 996
1996	283	3 943	76	921	5 223	-	-	-	-	-	2 769	7 979
1997	283	3 930	76	921	5 210	-	-	-	-	-	2 765	7 961
1998	293	3 916	76	921	5 196	-	-	-	-	-	-	4 275

and, assuming workers in SLDB schemes receive $5 per day, the accumulated cash deficit of the Board would be $36.8 mn by 1982. If interest were payable at seven per cent the accumulated deficit or debt would be $49.7 mn by 1984 and the payback period of the SLDB programme would be 24 years.

The financial rate of return calculated over 25 years for this operation is 7.4 per cent. If the replanting fund revenue is excluded the rate of return falls to 6.9 per cent.

The above analysis indicates that considerable care would have to be exercised in the management of SLDB operations and that possible means of providing development loans at interest rates below seven per cent should be explored.

13.3 THE ROAD-BASED IMPROVEMENT SCHEMES

13.31 The Physical Basis for the Economic Analysis

There are six RDAs in which road-based improvement schemes would be initiated during the Action Programme period 1975 to 1981. In all, these are estimated to involve about 46 000

TABLE 13.10 ESTIMATED SLDB FINANCIAL FLOW

Year	Revenue										Expenditure		Overall net cash flow	Overall net cash flow excluding replanting fund levy
	Cost of small-holder schemes re-imbursed by Government			Crop sales (excluding duty)					Replanting fund levy receipt	Total revenue	Payments to small-holders for produce	Crop production and project expenditure		
	Total costs	Credit net revenue from crop sales(1)	Net cost re-imbursed	Palm oil	Palm kernels	Rubber	Cocoa	Sub-total						
1974	493	-	493	-	-	-	-	-	-	493	-	493	-	-
1975	2 284	-	2 284	-	-	-	-	-	-	2 284	-	2 939	- 655	- 655
1976	1 854	-	1 854	-	-	-	-	-	-	1 854	-	4 010	-2 156	-2 156
1977	6 583	34	6 549	84	13	-	-	97	-	6 646	112	8 358	-1 824	-1 824
1978	6 474	72	6 402	724	102	-	30	856	-	7 258	602	16 133	-9 477	-9 477
1979	8 080	99	7 981	2 050	298	-	-	2 348	-	10 329	1 091	12 491	-3 253	-3 253
1980	5 728	1 382	4 346	4 070	602	-	330	5 002	55	9 403	3 521	13 545	-7 663	-7 718
1981	6 187	946	5 241	6 706	1 006	254	353	8 319	55	13 615	4 725	13 239	-4 349	-4 404
1982	2 723	1 088	1 635	9 522	1 442	515	405	11 884	106	13 625	7 922	13 132	-7 429	-7 535
1983	1 368	151	1 217	12 514	1 912	1 092	540	16 058	120	17 395	7 436	8 532	1 427	+1 307
1984	1 033	467	566	14 759	2 268	1 634	580	19 241	222	20 029	8 994	8 538	2 497	2 275
1985	-	-	-	16 040	2 476	2 707	540	21 763	246	22 009	9 811	7 563	4 635	4 389
1986	-	-	-	16 753	2 594	3 605		23 492	246	23 738	10 615	8 155	4 968	4 722
1987	-	-	-	17 011	2 632	4 593		24 776	275	25 051	11 384	7 848	5 819	5 544
1988	-	-	-	17 058	2 640	5 247		25 485		25 760	11 804	7 836	6 120	5 845
1989	-	-	-	16 956	2 624	5 680		25 800		26 075	12 041	7 882	6 152	5 877
1990	-	-	-	16 779	2 593	6 007		25 919		26 194	12 140	7 900	6 154	5 879
1991	-	-	-	16 539	2 558	6 254		25 891		26 166	12 181	7 921	6 064	5 789
1992	-	-	-	16 275	2 513	6 456		25 784		26 059	12 157	7 963	5 939	5 664
1993	-	-	-	16 965	2 461	6 559		26 525		26 800	13 084	7 946	5 770	5 495
1994	-	-	-	15 092	2 424	6 616		25 272		25 547	11 980	7 968	5 599	5 324
1995	-	-	-	15 413	2 381			24 950		25 225	11 841	7 942	5 442	5 167
1996	-	-	-	15 184	2 350			24 690		24 965	11 726	7 996	5 243	4 968
1997	-	-	-	14 981	2 316			24 453		24 728	11 618	7 979	5 131	4 856
1998	-	-	-	14 805	2 285			24 246		24 521	11 572	7 961	4 988	4 713

Note (1) Net sales value of crops produced in years 3 and 4 before hand over to small holders.

acres of crops based on about 180 miles of road and involving about 2 800 farmers of Native Customary Land. For planning purposes it has been assumed that on average 16 acres of crops would be developed per farmer under these schemes. Some 63 per cent of the areas that would be improved are within the Niah-Suai or Lambir-Subis RDAs and within 20 miles of oil palm mills. The balance of the improvement would be in outlying areas which are too remote from mills to justify inclusion of oil palms in their cropping patterns. A summary of the overall cropping pattern for the road-based schemes and its phasing is given in Table 13.11.

TABLE 13.11 CROPPING PATTERN AND PHASING OF ROAD-BASED IMPROVEMENT SCHEMES - NET ACRES

Year*	Oil palm	Rubber	Cocoa	Rice	Other crops
1975	850	990	190	150	230
1976	1 200	3 110	470	410	670
1977	1 280	3 900	590	520	850
1978	1 250	3 995	615	545	955
1979	1 490	3 915	615	555	945
1980	1 735	3 730	610	540	830
1981	2 415	4 250	750	640	970
Total	10 220	23 890	3 840	3 360	5 450

Note * This is the year in which clearing and land preparation is assumed to take place; crop planting would be in the following year.

On the basis of the number of farmers involved in the road-based schemes it appears that they would absorb about two-thirds of the resources of the ADU.

13.3.2 Costs

The principal costs of developing the crops and the organisation involved in the schemes are summarised in Table 13.12 and detailed in Appendix IV. The components of these costs and the computation methods employed are as follows.

(a) Crop costs include land development, production, transport and distribution. For the schemes as a whole, it has been necessary to adopt a computation procedure which gave the total costs for various items in any given year. The basis of the computations have been the cropping pattern, the costs of various crops and the total acreages developed in each year as given in Table 13.11.

The percentage of area that would be planted to each crop has been calculated separately for areas close to and remote from oil palm mills as follows:-

TABLE 13.12 SUMMARY OF ROAD BASED IMPROVEMENT SCHEMES COSTS $ THOUSAND

Year	Farm costs		Labour cost alternatives		Project costs		Total costs	
	Land development	Crop production	Opportunity value	Family subsistence income value	ADU management	Processing	At social prices Labour at (Opportunity value)	At market prices Labour at (Subsistence income value)
1975	16	-	50	75	1 082	-	1 148	1 173
1976	140	177	193	293	1 494	-	2 004	2 104
1977	349	492	421	638	1 423	-	2 685	2 902
1978	486	821	724	1 096	1 694	4	3 729	4 101
1979	541	1 183	1 095	1 659	1 680	40	4 539	5 103
1980	570	1 629	1 519	2 301	1 750	117	5 585	6 367
1981	595	2 116	1 983	3 005	2 237	227	7 158	8 180
1982	615	2 806	2 289	3 468	1 748	391	7 849	9 028
1983	277	2 940	2 521	3 819	1 913	664	8 315	9 613
1984	140	3 351	2 682	4 064	2 299	1 039	9 511	10 893
1985	↓	3 781	2 769	4 196	2 779	1 494	10 963	12 390
1986		4 117	↓	↓	3 299	1 918	12 243	13 670
1987		4 365			3 723	2 299	13 296	14 723
1988		4 648			4 006	2 666	14 229	15 656
1989		4 675			4 269	2 899	14 752	16 179
1990		4 771			4 395	3 061	15 136	16 563
1991		4 839			4 542	3 165	15 455	16 882
1992		4 897			4 493	3 231	15 530	16 957
1993		4 951			4 561	3 277	15 698	17 125
1994		4 959			4 560	3 300	15 728	17 155
1995		4 961			4 623	3 308	15 801	17 228
1996		4 951			4 583	3 296	15 739	17 166
1997		4 939			4 571	3 284	15 703	17 130
1998		4 931			4 560	3 273	15 673	17 100
1999		4 931			4 549	3 262	15 651	17 078

TABLE 13.13 AVERAGE CROP COSTS DERIVED FOR ROAD BASED IMPROVEMENT SCHEMES $ PER ACRE

Year	Area within reach of oil palm mills Cost ($)			Areas remote from oil palm mills Cost ($)		
	Land development	Crop production materials	Transport and distribution	Land development	Crop production materials	Transport and distribution
0	6.6	-	-	7.4	-	-
1	41.3	73.3	-	47.7	52.1	-
2	17.2	47.2	-	21.1	34.2	-
3	2.8	50.9	1.3	3.3	35.3	-
4	2.8	59.3	9.9	3.3	39.3	0.7
5	↓	65.8	17.0	↓	41.5	1.3
6		64.7	21.9		41.2	2.0
7		79.6	32.3		66.5	16.4
8		70.2	36.6		50.8	22.4
9		70.5	39.4		50.8	26.2
10		69.8	40.9		50.1	28.8
11		69.7	41.6		50.1	30.1
12		73.0	42.2		55.7	31.5
13		73.0	42.9		55.7	31.2
14		73.0	43.3		55.7	34.6
15		73.0	43.1		55.7	34.6
16		73.0	42.5		55.7	↓
17		73.6	42.2		56.5	
18		72.9	41.7		55.7	
19		72.9	41.2		55.7	
20		↓	41.2		↓	
21			40.9			
22			40.9			
23			40.6			
24			40.6			
25	↓	↓	40.4	↓	↓	↓

Area category	Percentage of total area				
	Oil palm	Rubber	Cocoa	Rice	Other crops
Close to oil palm mills	35	41	8	6	10
Remote from oil palm mills	-	70	8	8	14

The percentages are based on the cropping patterns described in Chapter 1. The basic crop costs on which the analysis is based are given in Part IV of this Supporting Report and the computed weighted average costs per acre for each cropping pattern are given in Table 13.13.

Costs in each year of the schemes were derived for each of the following categories:-

- land development;
- production;
- transport and distribution.

(b) Processing costs have been based on a rate per ton for products from the main tree crops as follows:-

- oil palm at $12 per ton ffb from all schemes;
- rubber at $140 per ton drc assuming that latex is delivered to a crumb rubber factory;
- cocoa fermentation and drying in Samoan-type driers at $78.40 per ton dried bean equivalent (dbe).

The total processing costs have been calculated from the crop production quantities estimated for the schemes which are given in Table 13.14.

TABLE 13.14 CROP PRODUCTION ON ROAD-BASED IMPROVEMENT SCHEMES - TONS

Crops	Year																						
	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Oil palm ffb			340	3116	8654	16320	25169	35278	47106	60730	69754	74788	76851	77505	77411	76675	75769	74514	73198	71892	70863	69905	68954
Palm oil			68	623	1731	3264	5034	7056	9421	12146	13951	14958	15370	15501	15482	15335	15154	14903	14640	14378	14378	→	
Kernels			10	107	318	639	1005	1403	1873	2425	2769	2991	3074	3100	3096	3067	3031	2981	2928	2876	2876	→	
Rubber (drc)							238	1122	2592	4469	6575	8765	11228	12836	14005	14808	15362	15797	16076	16244	16244	→	
Cocoa (dbe)				36	162	400	715	1062	1411	1786	2042	2166	2166	→									
Rice - padi		118	454	932	1512	2164	2828	3574	3832	4031	4134	4134	→										

(drc) - dry rubber content
(dbe) - dry bean equivalent

(c) ADU managements costs have been taken from Part III of this Supporting Report and include the costs of staff, training, housing, vehicles, equipment and general running costs. Actual costs of the Extension and Economic Section of the ADU have been calculated on the basis of staff and equipment employed directly on the schemes plus two-thirds of the Headquarters Section costs.

13.3.3 Revenues

The revenues attributed to the scheme would be made up of the value of the crops produced at their projected fob prices given in Part IV. For commercial analysis the export duties have been deducted at appropriate rates. The value of 'other crops' has been included on the basis of the estimated net values attributed to the house plot production on small-holder settlement schemes (see Section 13.2.3).

An estimate of crop production from road-based schemes is given in Table 13.14. Yields of tree crops are assumed to be 15 per cent lower than those achieved on public sector and private investor schemes because it is unlikely that the road-based schemes will attain the high level of crop husbandry anticipated for the public sector and private investor schemes.

13.3.4 Economic Analysis

13.3.4.1 Economic Evaluation at Market Prices

The net cash flow computed for the road-based schemes is summarised in Table 13.15, depicted in Figure 13.2, and detailed in Appendix IV. The investment period of the scheme, that is when costs exceed revenue, would be nine years and the accumulated annual deficits amount to $28.4 mn by 1983. The annual cash surplus would rise to a peak of $14.4 mn in 1999. The analysis has been computed at basic prices and allows for export duties on palm oil and rubber.

The commercial rate of return would be 15.9 per cent which is satisfactory for an investment with interest payable at seven to eight per cent.

13.3.4.2 Economic Evaluation at Social Prices

The net cash flow is shown at social prices in Table 13.16. For this analysis labour has been valued at its opportunity cost or value of present subsistence production which would probably be lost as a result of the schemes being implemented. This value, assessed on the basis of the farm survey data given in Appendix VI, would be as follows:-

Year	Value $
1	330
2	500
3	670
4	830
5 and onwards	1 000

The internal rate of return and net present values calculated

TABLE 13.15 ROAD BASED IMPROVEMENT SCHEMES - CASH FLOW AT MARKET PRICES

Scheme year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Gross sales revenue (excluding duty)			60.4	266.4	821.4	1808.4	3167.5	4991.0	7643.5	10782.9	14517.5	17870.4	20750.4	23458.5	25183.6	26385.7	27156.2	27654.0	27998.8	28176.6	28239.8	28239.8			
Total farm costs	90.9	609.3	1478.3	2403.1	3382.9	4499.7	5715.9	6888.5	7035.9	7554.5	8116.6	8452.5	8700.1	8983.4	9010.4	9106.5	9174.2	9232.0	9286.3	9294.5	9296.1	9285.8	9274.5	9266.3	9266.3
Total project costs	1082.4	1494.2	1422.7	1693.5	1680.1	1749.7	2236.5	1748.2	1912.7	2299.1	2779.2	3299.1	3722.5	4005.8	4268.6	4395.3	4542.2	4493.3	4561.3	4560.0	4622.7	4582.5	4571.0	4559.6	4548.8
Net cash flow	-1173.3	-2103.5	-2840.6	-3830.2	-4241.6	-4441.0	-4784.9	-3645.7	-1305.1	+929.3	+3621.7	+6118.8	+8327.8	+10469.3	+11904.6	+12883.9	+13439.8	+13928.7	+14151.2	+14322.1	+14321.0	+14371.5	+14394.3	+14413.9	+14424.7

TABLE 13.16 ROAD BASED IMPROVEMENT SCHEMES - CASH FLOW AT SOCIAL PRICES

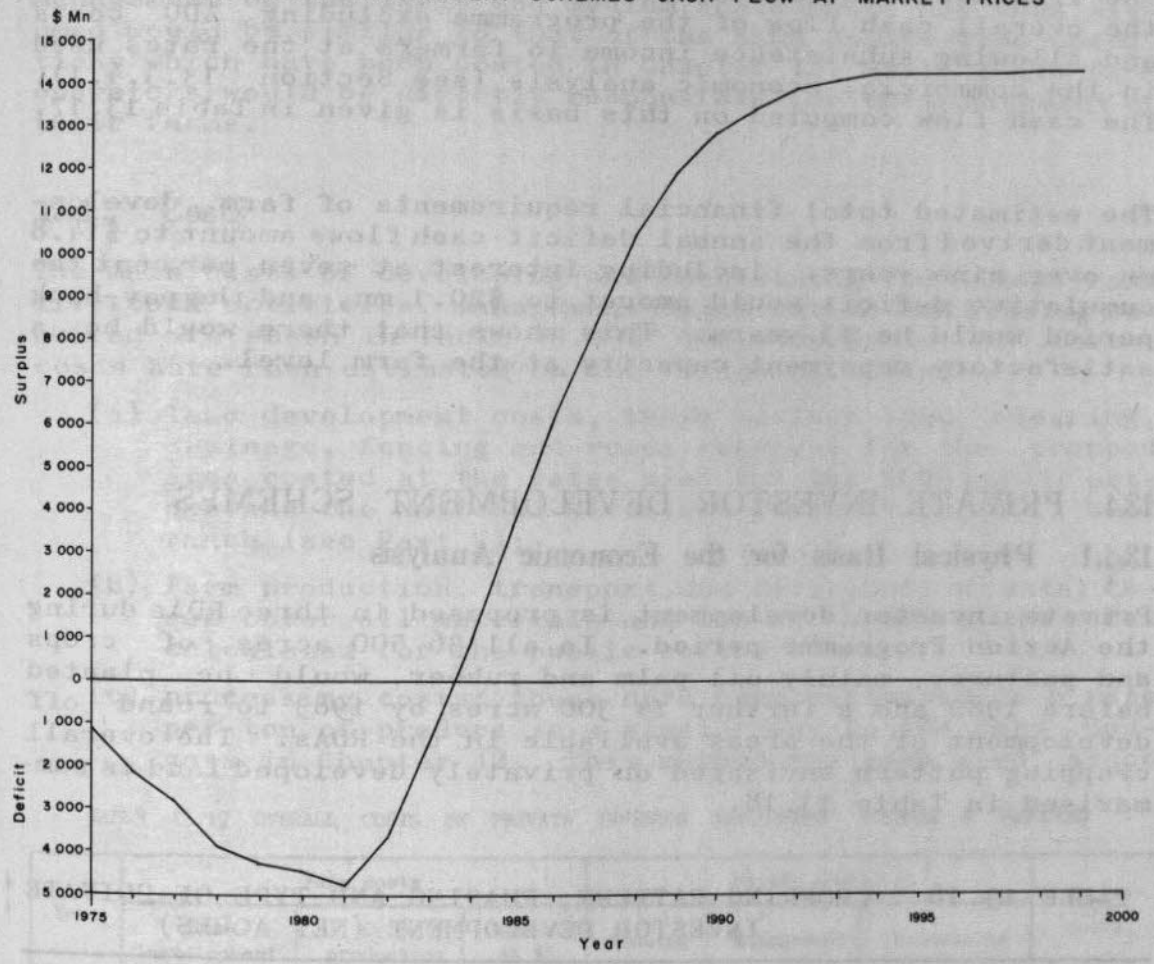
Scheme year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Gross revenue (fob price)	-	-	60.4	268.9	842.5	1865.6	3272.0	5166.6	7937.8	11233.0	15166.6	18704.0	21749.9	24619.9	26447.2	27719.9	2834.8	29060.9	29424.4	29611.1	29676.4	29676.4			
Total farm costs	65.4	509.9	1261.6	2030.4	2818.9	3717.4	4694.4	5709.6	5737.3	6172.9	6690.1	7026.0	7273.6	7556.9	7167.4	7456.3	7706.8	7724.6	7838.4	7860.4	7931.0	7878.4	7855.4	7832.6	7839.8
Total project costs	1082.4	1494.2	1422.7	1697.6	1720.3	1866.2	2463.7	2139.6	2576.4	3337.9	4273.6	5216.7	6021.2	6671.3	7167.4	7456.3	7706.8	7724.6	7838.4	7860.4	7931.0	7878.4	7855.4	7832.6	7811.0
Net cash flow	-1147.8	-2004.1	-2623.9	-3459.1	-3696.7	-3718.0	-3886.1	-2682.6	-375.9	+1722.2	+4202.9	+6461.3	+8455.1	+10391.7	+11695.9	+12583.6	+13080.3	+13530.8	+13726.2	+13882.7	+13875.8	+13938.7	+13973.0	+14004.0	+14025.6

TABLE 13.17 ROAD BASED IMPROVEMENT SCHEMES - SUMMARY FINANCIAL REQUIREMENT AND REPAYMENT CAPACITY

Scheme year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Gross sales revenue			60.4	266.4	821.4	1808.4	3167.5	4991.0	7643.5	10782.9	14517.5	17870.4	20750.4	23458.5	25183.6	26385.7	27156.2	27654.0	27998.8	28176.6	28239.8	28239.8			
Total costs and farmer income requirements	90.9	609.3	1478.3	2407.2	3423.1	4616.2	5943.1	7279.9	7699.6	8593.3	9611.0	10370.1	10998.8	11648.9	11909.2	12167.5	12338.8	12463.3	12563.4	12594.9	12604.3	12581.7	12558.9	12539.3	12528.5
Net balance required/available for repayment	-90.9	-609.3	-1417.9	-2140.8	-2601.7	-2807.8	-2775.6	-2288.9	-56.1	+2189.6	+4906.5	+7500.3	+9751.6	+11809.6	+13274.4	+14218.2	+14817.4	+15190.7	+15435.4	+15581.7	+15635.5	+15658.1	+15680.9	+15700.5	+15711.3
Cumulative outstanding balance including interest at seven per cent	-97.3	-756.1	-2326.2	-4779.7	-7898.1	-11455.3	-15227.1	-18742.1	-20114.1	-19179.2	-15271.8	-8315.5	+1536.6	+14280.4	+29483.6	+46760.9	+65888.8	+86755.1	+109343.8	+133670.3	+159757.2	+187694.4	+217611.6	+249643.9	+283930.1

FIGURE 13.2

ROAD BASED IMPROVEMENT SCHEMES CASH FLOW AT MARKET PRICES



on this basis would be as follows:-

- IRR, 17.7 per cent;
- NPV over 25 years $37.7 mn at seven per cent interest, and $19.1 mn at 10 per cent interest.

These returns are regarded as satisfactory when compared to the opportunity cost of capital and indicate that the economy would benefit from the schemes.

13.3.4.3 Financial Analysis

In addition to setting up the ADU as discussed and costed in detail in Part III it would be necessary to ensure that sufficient funds are available to meet financial requirements at the farm level. The following analysis attempts to estimate these needs and to assess the overall financial viability of the schemes.

The financial requirements of farmers have been derived from the overall cash flow of the programme excluding ADU costs and allowing subsistence income to farmers at the rates used in the commercial economic analysis (see Section 13.3.4.1). The cash flow computed on this basis is given in Table 13.17.

The estimated total financial requirements of farm development derived from the annual deficit cash flows amount to $14.8 mn over nine years. Including interest at seven per cent the cumulative deficit would amount to $20.1 mn, and the pay-back period would be 13 years. This shows that there would be a satisfactory repayment capacity at the farm level.

13.4 PRIVATE INVESTOR DEVELOPMENT SCHEMES

13.4.1 Physical Basis for the Economic Analysis

Private investor development is proposed in three RDAs during the Action Programme period. In all 36 500 acres of crops and pastures, mainly oil palm and rubber, would be planted before 1980 and a further 14 300 acres by 1983 to round off development of the areas available in the RDAs. The overall cropping pattern envisaged on privately developed land is summarised in Table 13.18.

TABLE 13.18 CROPPING PATTERN, PHASING AND TYPE OF PRIVATE INVESTOR DEVELOPMENT (NET ACRES)

Year	Cropping pattern						Farm type	
	Oil palm	Rubber	Cocoa	Rice	Beef ranch	Total	Small scale	Medium and large scale
1976	1 362	388	124	70	500	2 444	828	1 616
1977	3 147	898	289	160	1 000	5 494	828	4 666
1978	5 352	1 529	497	270	1 000	8 648	828	7 820
1979	4 246	3 277	1 277	213	1 225	10 238	366	9 872
1980	2 462	3 314	1 345	123	2 450	9 694	366	9 328
1981	2 661	3 372	1 364	134	2 450	9 981	653	9 328
1982	200	2 666	1 135	10	-	4 011	285	3 726
1983	200	56	19	10	-	285	285	-
Total	19 630	15 500	6 050	990	8 625	50 795	4 439	46 356

The recommended pattern of private investor development would involve large, medium and small scale farming operations. For purposes of this analysis the size of units in these categories has been assumed as follows:-

- large scale > 2 000 acres of crops or pastures;
- medium scale 2 000 > 100 acres of crops or pastures;
- small scale < 100 acres of crops or pastures.

Management on the large and medium scale units has been assumed would be similar to that of the SLDB estate-type operations which have been costed in Chapter 12. Small scale farm operators would be directly responsible for the management of their farms.

13.4.2 Costs

The main costs of developing and maintaining the crops and livestock activities, management organisation and housing required are shown in Table 13.19. The components of these costs have been estimated on the following basis:-

(a) land development costs, these include land clearing, drainage, fencing and roads required for the cropped area costed at the rates used for the SLDB public estate and the National Livestock Corporation (NLC) beef ranch (see Part V);

(b) farm production, transport and distribution costs; these cover all materials and labour inputs at the rates calculated for the public sector schemes;

(c) processing costs; these have been estimated on a rate per ton of produce in a similar way to the Farm Budgets in Chapter 12. This method has been used since

TABLE 13.19 OVERALL COSTS OF PRIVATE INVESTOR DEVELOPMENT SCHEMES $ THOUSAND

Year	Farm costs			Estate costs			Total costs
	Land development	Crop production	Labour at $5	Housing	Management	Processing	
1976	306.0	51.5	89.5	-	604.6	-	1051.6
1977	902.9	738.6	499.5	486.0	837.3	-	3464.3
1978	1512.2	996.5	1344.0	1071.7	1112.5	-	6036.9
1979	2452.2	1704.2	2138.5	1799.5	1561.7	8.2	9664.3
1980	3171.1	2733.9	3188.5	2118.3	2283.5	77.8	13573.1
1981	3283.6	3186.4	4116.0	1758.9	2815.7	267.8	15428.4
1982	2487.9	4008.8	4914.5	1161.9	2876.4	612.9	16062.4
1983	1677.7	4426.1	5073.5	241.8	2748.4	1035.0	15202.5
1984	1279.3	4932.4	4867.0	243.5	2635.9	1452.1	15410.2
1985	1095.8	5484.6	4668.5	164.1	2328.8	1861.1	15602.9
1986	1007.2	6012.0	4741.5	164.1	291.5	2247.0	14463.3
1987	1006.6	6378.2	5068.5	↓	394.1	2605.5	15617.0
1988	986.9	6656.2	5576.5		353.4	2942.2	16679.3
1989	859.3	6822.4	6085.5		299.1	3242.1	17472.5
1990	856.6	6842.8	6420.0		291.5	3422.7	17997.7
1991	856.6	6902.5	6606.0		291.5	3531.6	18352.3
1992	↓	6939.3	6726.0		469.9	3600.0	18755.9
1993		6978.8	6830.5		299.1	3568.1	18697.2
1994		7002.7	6931.0		326.8	3666.8	18948.0
1995		6993.2	7025.0		291.5	3667.4	18997.8
1996		6982.8	7089.5		299.1	3667.4	19059.5
1997		6958.6	7121.0		299.1	↓	19066.8
1998		6942.1	7151.5		394.1		19175.8
1999		6925.6	7154.0		310.5		19078.2
2000	↓	6903.1	7156.5	↓	469.9	↓	19217.6

it is not clear what processing facilities for oil palm and rubber would be required in addition to those to be established by the SLDB and those already existing in the private sector estates. The costs include an element to cover capital items. The eventual processing capacities required to handle the output of crops from the fully developed area are discussed in Appendix II;

(d) management costs; for those areas proposed for large and medium scale farms the management costs for oil palm, rubber and cocoa have been estimated on the basis of the per acre costs given in Part IV assuming an SLDB estate-type organisation. Similarly beef ranch management costs derived for the NLC ranch in Part V have been used for the areas developed to cattle. No management cost has been attributed to the small scale farmer operations since it is assumed that their needs would be covered by the existing Department of Agriculture Extension Service and the ADU organisation;

(e) housing costs; the number of full time labourers required to operate the crop areas has been the basis of estimating these costs. Houses have been assumed to accommodate two workers each and cost $4 500 to construct. Annual maintenance has been allowed at two per cent of construction costs.

13.4.3 Revenues

The values of the crops and animals produced have been estimated on the basis of the physical outputs given in Appendix IV at fob prices. For the financial analysis export duties have been deducted.

13.4.4 Economic and Financial Analysis

13.4.4.1 Economic Evaluation at Social Prices

The net cash flow at social prices is summarised in Table 13.20 and detailed in Appendix IV. For this analysis labour inputs have been costed at $3 per man day and all other items at the rates used for public sector schemes. Output has been valued at fob prices or net retail value for beef cattle and subsistence crops.

Under these conditions the internal rate of return would be 18.2 per cent and the net present values of the cash flow over 25 years would be as follows:-

- $64.2 mn at seven per cent interest;
- $34.4 mn at ten per cent interest.

These returns are very satisfactory and indicate the substantial economic benefit which the Sarawak economy would derive

TABLE 13.20 CASH FLOW OF PRIVATE INVESTOR SCHEMES AT SOCIAL PRICES - THOUSAND DOLLARS

Year	Gross revenue	Crop costs	Estate costs	Net cash flow
1976	-	411	309	-720
1977	-	1 941	351	-2 292
1978	17	3 315	658	-3 956
1979	137	5 439	519	-5 821
1980	871	7 818	1 887	-8 834
1981	2 672	8 940	2 437	-8 705
1982	5 847	9 445	2 621	-6 219
1983	10 200	9 148	3 995	-2 943
1984	14 105	9 132	4 332	+641
1985	19 168	9 381	4 354	+5 433
1986	23 099	9 864	2 703	+10 532
1987	26 968	10 426	3 164	+13 378
1988	30 031	10 989	3 460	+15 582
1989	32 395	11 333	3 705	+17 357
1990	34 057	11 551	3 878	+18 628
1991	34 926	11 723	3 987	+19 216
1992	35 460	11 831	4 234	+19 395
1993	35 811	11 934	4 031	+19 846
1994	36 002	12 018	4 158	+19 826
1995	36 016	12 065	4 123	+19 828
1996	36 016	12 093	4 131	+19 792
1997	↓	12 088	4 131	+19 791
1998		12 090	4 226	+19 700
1999		12 075	4 142	+19 799
2000		12 054	4 301	+19 661

from the schemes if they were developed.

134.4.2 Financial Analysis

For this analysis two possible private estate situations have been examined with a view to assessing their financial viability and the overall financial requirement of the development has been assumed. The estate situations selected have been the following:-

- 3 500 acres, large scale estate with oil palm, rubber and cocoa;
- 600 acres, medium scale estate based on rubber and cocoa.

Large Scale Estate

The type of scheme envisaged would have an identical cropping pattern to that recommended in Chapter 6 for the SLDB sub-scheme at Sawai, Igang and Jatan. The Sawai sub-unit has been considered to be most typical of the private sector schemes and has been selected for this analysis. Adjustments have been made to the calculations of the SLDB scheme costs

as follows:-

- the replanting levy has been excluded since the private investor would build up his own fund for this purpose from profits accruing during the life of the scheme;
- worker transport has been excluded because on an independent estate the area developed would be sufficiently compact for workers to walk to work.

TABLE 13.21 CASH FLOW OF LARGE-SCALE PRIVATE INVESTOR ESTATE

Year	Gross sales revenue	Crop costs	Net farm revenue	Estate costs(1)	Net cash flow	Repayment capacity		
						Cumulative balance	Interest @ 7%	New balance
1977	-	347	- 347	108	- 455	- 455	- 32	- 487
1978	-	1 370	-1 370	754	-2 124	-2 611	-183	-2 794
1979	-	560	- 560	740	-1 300	-4 094	-287	-4 381
1980	116	998	- 882	379	-1 261	-5 642	-395	-6 037
1981	906	709	+ 197	404	- 207	-6 244	-437	-6 681
1982	1 543	833	+ 710	544	+ 166	-6 515	-456	-6 971
1983	1 964	800	+1 164	636	+ 528	-6 443	-451	-6 894
1984	2 299	849	+1 450	717	+ 733	-6 161	-431	-6 592
1985	2 461	851	+1 610	755	+ 855	-5 737	-402	-6 139
1986	2 581	830	+1 751	779	+ 972	-5 167	-362	-5 529
1987	2 629	838	+1 791	788	+1 003	-4 526	-317	-4 843
1988	2 653	840	+1 813	793	+1 020	-3 823	-268	-4 091
1989	2 660	854	+1 806	793	+1 013	-3 078	-215	-3 293
1990	2 667	857	+1 810	794	+1 016	-2 277	-159	-2 436
1991	2 652	861	+1 791	788	+1 003	-1 433	-100	-1 533
1992	2 631	861	+1 770	784	+ 986	- 547	- 38	- 585
1993	2 585	861	+1 724	772	+ 952	+ 367	+ 26	+ 393
1994	2 563	893	+1 670	767	+ 903	-	-	-
1995	2 519	890	+1 629	757	+ 872	-	-	-
1996	2 475	890	+1 585	746	+ 839	-	-	-
1997	2 475	890	+1 585	746	+ 839	-	-	-
1998	2 452	890	+1 562	741	+ 821	-	-	-
1999	2 452	890	+1 562	741	+ 821	-	-	-
2000	2 430	890	+1 540	736	+ 804	-	-	-
2001	2 430	890	+1 540	736	+ 804	-	-	-
2002	2 408	890	+1 518	730	+ 788	-	-	-

Note (1) 'Estate' costs cover housing and management.

The net cash flow and repayment calculations for the estate are given in Table 13.21. The commercial rate of return to such an enterprise would be 10.6 per cent at basic prices and at raised rubber and palm oil prices would be about 16 per cent. Capital investment required for the scheme has been estimated at $6.9 mn and the pay-back period would be 16 years including interest at seven per cent.

These achievements are comparable with those of the SLDB public sector estate.

Medium Scale Estate

Two-thirds of the 600 cropped acres of this example estate

TABLE 13.22 CASH FLOW OF MEDIUM-SCALE PRIVATE ESTATE

Year	Gross sales revenue	Crop costs	Net farm revenue	Estate costs(1)	Net cash flow	Repayment capacity		
						Cumulative balance	Interest @ 7%	New balance
1977	-	-	-	28	- 51	- 51	4	- 55
1978	-	129	-129	164	-440	- 495	35	- 530
1979	-	114	-114	116	-234	- 764	53	- 817
1980	-	98	- 98	37	-165	- 982	69	-1 051
1981	50	84	- 34	37	- 84	-1 135	79	-1 214
1982	100	84	16		- 40	-1 250	88	-1 336
1983	150	87	63		- 21	-1 359	95	-1 454
1984	290	137	153		+ 65	-1 389	97	-1 486
1985	374	156	218		+116	-1 370	96	-1 466
1986	429	162	267		+156	-1 310	92	-1 402
1987	464	167	297		+181	-1 221	85	-1 306
1988	483	168	315		196	-1 110	78	-1 188
1989	503	177	326		204	- 984	69	-1 053
1990	528	178	350		224	- 829	58	- 887
1991	548	180	368		239	- 648	45	- 693
1992	548	180	368		239	- 454	32	- 486
1993		180	368		239	- 247	17	- 264
1994		182	366		237	- 27	2	- 29
1995		180	368		239	+ 210	15	+ 225
1996		180	368		239			
1997								
1998								
1999								
2000								
2001								
2002								

Note (1) 'Estate' costs cover housing and management.

have been assumed to be under rubber and the balance under cocoa; a situation which could occur at Beseduan in the Labang-Tubau RDA.

The cash flow and repayment capacity calculation given in Table 13.22 and Appendix IV assume a raised rubber price. The commercial rate of return achieved would be 10.5 per cent and the pay-back period would be 18 years with interest at seven per cent. Capital invested would be $1.03 mn over six years and including funded interest would amount to $1.486 mn in the eighth year of operations.

The above analyses are useful in assessing how attractive investment in this type of agricultural development is likely to be to private investors. A number of comments are relevant including the following:-

(a) The economic returns from the schemes are comparable with alternative forms of investment if the opportunity cost of capital is between 10 and 15 per cent in the private sector.

(b) Investments in agricultural estates are of a long term nature and suffer from the disadvantage of a slow pay-back of original investment. A period of 15 to 17 years would be regarded as normal and is largely the

result of the crops involved taking some time to reach maturity. Against this, however, must be weighed the market value of the asset created by the investment which, in most cases, would equal the capital outlay if it were realised.

The conclusions to be drawn from the above analyses and observations are the following:-

(a) Private investments in agricultural schemes are not likely to be attractive unless the investor is able to gain secure negotiable title to the assets created.

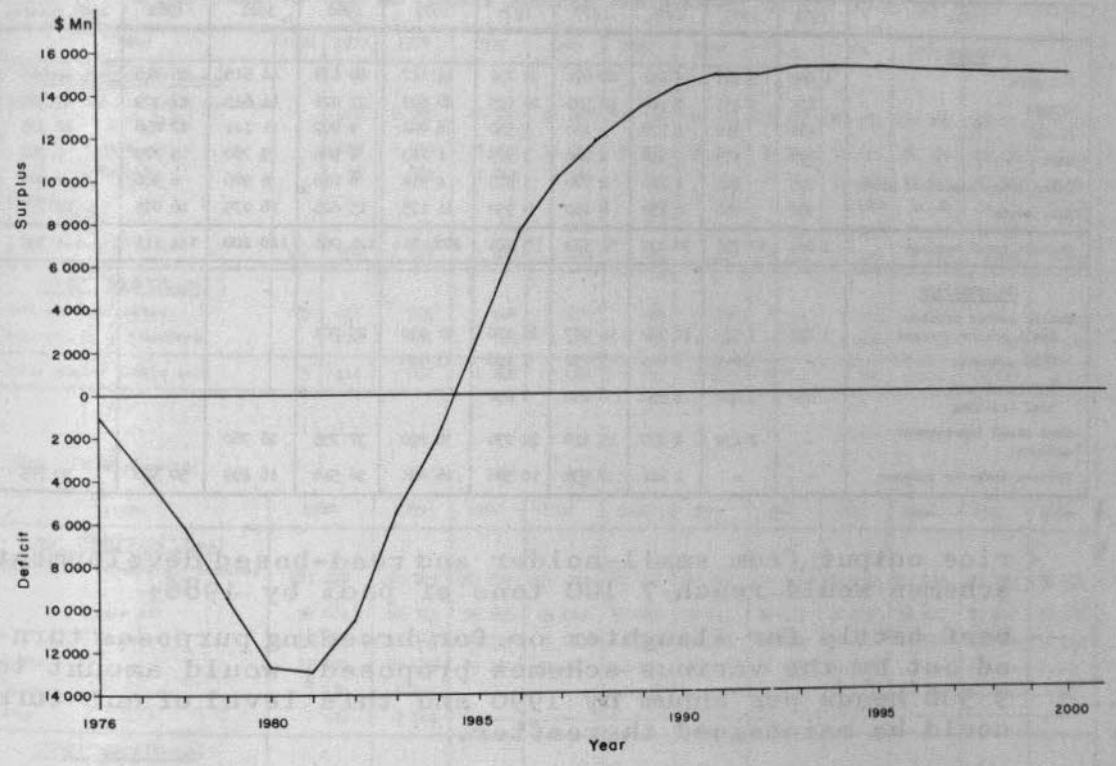
TABLE 13.23 OVERALL FINANCIAL ANALYSIS OF PRIVATE INVESTORS DEVELOPMENT - $'000

Year	Revenue	Costs	Net cash flow	Cumulative deficit balance including interest at 7 per cent
1976	-	1 052	-1 052	1 126
1977	-	3 464	-3 464	4 911
1978	17	6 037	-6 020	11 696
1979	132	9 664	-9 532	22 714
1980	828	13 574	-12 746	37 942
1981	2 529	15 428	-12 899	54 400
1982	5 520	16 062	-10 542	69 488
1983	9 650	15 202	-5 552	80 293
1984	13 359	15 411	-2 052	88 109
1985	18 218	15 603	+2 615	91 479
1986	21 965	14 464	7 601	89 850
1987	25 668	15 617	10 051	85 391
1988	28 580	16 680	11 900	78 635
1989	30 812	17 472	13 340	69 866
1990	32 396	17 997	14 399	59 350
1991	33 210	18 352	14 858	47 606
1992	33 725	18 756	14 969	34 922
1993	34 060	18 697	15 363	20 928
1994	34 243	18 948	15 295	6 027
1995	34 260	18 998	15 262	-
1996	34 260	19 060	15 200	-
1997	34 260	19 067	15 193	-
1998	34 260	19 176	15 084	-
1999	34 260	19 078	15 182	-
2000	34 260	19 217	15 043	-

(b) The availability of loan or development funds at relatively low rates of interest and on easy repayment terms appear to be necessary to encourage investors to undertake agricultural operations. An estimate of the funds required to finance the proposed private investor programme are derived from the cash flow given in Table 13.23 and depicted in Figure 13.3. The net amount required would be $63.9 mn over nine years. The pay-back period for the overall scheme with interest

FIGURE 13.3

PRIVATE INVESTOR CASH FLOW AT MARKET PRICES



payable at seven per cent would be 19 years.

13.5 OVERALL ECONOMIC EVALUATION

13.5.1 Physical Development and Production

The total area of crops and pastures established under schemes on which this analysis is based would be 144 000 net acres by 1980 and further 121 000 acres by 1984. In Table 13.24 the overall cropping pattern and its phasing is summarised.

At the expected average yields and processing recovery rates the overall production from these areas is expected to be as follows:-

- oil palm production in terms of palm oil and kernels would reach a peak in 1988 when 97 000 and 19 000 tons respectively would be produced;
- rubber output would commence in 1981 and reach a peak of 35 000 tons per annum in 1995;
- cocoa plantations would reach full production of 7 800 tons per annum by 1988.

TABLE 13.24 OVERALL SUMMARY OF AREAS DEVELOPED UNDER SCHEMES INITIATED DURING THE ACTION PROGRAMME
(CUMMULATIVE NET ACRES)

Items	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983 onwards
CROPS										
Oil palm	1 890	5 985	12 492	22 094	32 731	44 447	40 439	44 515	55 715	55 915
Rubber	875	2 235	7 148	12 591	20 645	28 607	37 021	44 643	47 309	47 365
Cocoa	120	310	1 779	3 438	4 550	6 892	9 007	11 121	12 256	12 275
Rice	195	345	1 250	2 260	3 375	4 143	4 986	5 760	5 770	5 780
Other crops/homestead plots	195	425	1 120	2 700	3 973	4 918	6 016	6 986	6 986	6 986
Beef ranch	950	3 450	6 450	8 450	9 950	11 175	13 625	16 075	16 075	16 075
Overall total acreage	4 225	12 750	30 239	51 533	75 224	100 182	121 094	140 100	144 111	144 396
ORGANISATION										
Public sector schemes										
.Small-holder schemes	3 275	3 275	10 360	14 087	21 270	21 930	25 701			
SLDB schemes	-	3 615	3 615	7 150	7 150	13 690				
NLC ranch and beef training	950	3 450	5 950	6 950	7 450					
Road based improvement schemes	-	2 410	8 270	15 410	22 770	30 290	37 735	46 760		
Private investor schemes	-	-	2 444	7 938	16 586	26 824	36 518	46 499	50 510	50 795

- rice output from small-holder and road-based development schemes would reach 7 100 tons of padi by 1986;
- beef cattle for slaughter or for breeding purposes turned out by the various schemes proposed, would amount to 9 900 heads per annum by 1990 and this level of out-turn could be maintained thereafter.

Table 13.25 summarises the output of the overall agricultural development programme.

13.5.2 Economic Evaluation

The agricultural development undertaken during the Action Programme would give an internal rate of return of 14 per cent per annum. The overall cash flow is summarised in Table 13.26. The direct benefits attributed to this development include the following:-

- a large proportion of the activities undertaken would be labour intensive and result in a substantial creation of employment opportunities;
- incomes generated in the agricultural sector would be well above current earnings in traditional subsistence agriculture and an equitable distribution of this new wealth would be assured by the labour : land ratio and the pattern of development organisation proposed;
- a substantial contribution to the net foreign exchange reserves of the country would be derived from the programme since in general the schemes would have a high direct export and a low direct import content;
- tax and duty revenues accruing to the Government would be considerable and could be adjusted or revised to acc-

TABLE 13.25 OVERALL SUMMARY OF CROP AND LIVESTOCK PRODUCTION FROM DEVELOPMENT INITIATED DURING THE ACTION PROGRAMME

Items	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
CROP PRODUCTION (Tons)												
Oil palm - Fresh fruit bunches (ffb)		945	8 765	28 980	66 265	124 390	199 905	286 225	362 055	422 100	457 775	476 020
- Palm oil		189	1 753	5 796	13 253	24 878	39 981	57 981	72 411	84 420	91 555	95 204
- Kernels		38	321	1 062	2 489	4 758	7 776	11 243	14 355	16 853	18 309	19 038
Rubber						245	735	2 284	4 594	8 129	12 405	17 298
Cocoa			26	90	462	1 165	2 057	3 133	4 317	5 717	6 886	7 573
Rice	152	292	1 048	1 993	3 163	4 212	5 317	6 332	6 698	6 979	7 105	7 108
CATTLE SOLD (Heads)												
Cull cows and bulls	75	212	334	496	578	786	1 028	1 114	1 296	1 541	1 635	1 764
Beef steers and heifers		200	658	766	2 471	2 305	4 077	4 708	5 098	6 760	6 648	7 667
Total number cattle sold	75	412	992	1 262	3 049	3 091	5 105	5 822	6 394	8 301	8 283	9 431

TABLE 13.25 (cont'd)

Items	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
CROP PRODUCTION (Tons)											
Oil palm - Fresh fruit bunches (ffb)	483 120	483 715	480 825	475 200	468 415	460 265	452 365	444 160	441 035	438 270	435 875
- Palm oil	96 624	96 743	96 165	95 040	93 683	92 053	90 473	88 832	88 207	87 654	87 175
- Kernels	19 323	19 348	19 219	19 001	18 714	18 377	18 079	17 752	17 642	17 523	17 413
Rubber	22 400	26 456	29 261	31 220	32 653	33 737	34 472	34 910	→	→	→
Cocoa	7 830	7 835	→	→	→	→	→	→	→	→	→
Rice	7 109	7 109	→	→	→	→	→	→	→	→	→
CATTLE SOLD (Heads)											
Cull cows and bulls	1 788	1 817	1 991	→	→	→	→	→	→	→	→
Beef steers and heifers	7 814	7 880	7 966	→	→	→	→	→	→	→	→
Total number cattle sold	9 602	9 697	9 957	9 957	9 957	9 957	9 957	9 957	9 957	9 957	9 957

TABLE 13.26 OVERALL SUMMARY CASH FLOW OF THE AGRICULTURAL PLAN AT SOCIAL PRICES $ THOUSAND

Year	Gross revenue	Farm costs	Net farm costs	Project/Estate costs	Forestry revenue	Net project costs	Net cash flow	
							Including forestry	Excluding forestry
1974	-	729	- 729	1 277	356	921	- 1 650	- 2 006
1975	-	5 199	- 5 199	3 449	441	3 008	- 8 207	- 8 648
1976	97	6 623	- 6 526	4 172	1 068	3 104	- 9 630	-10 698
1977	396	10 611	-10 215	7 161	1 759	5 402	-15 617	-17 376
1978	1 743	12 578	-10 835	14 337	2 306	12 031	-22 866	-25 172
1979	4 152	16 773	-12 621	10 657	4 239	6 418	-19 039	-23 278
1980	9 790	21 314	-11 524	11 340	5 222	6 118	-17 632	-22 864
1981	16 990	22 858	- 5 868	14 290	2 405	11 885	-17 753	-20 158
1982	26 552	25 342	+ 1 210	14 525	2 030	12 495	-11 285	-13 315
1983	38 203	24 366	+13 837	11 026	30	10 996	+ 2 841	+ 2 811
1984	48 818	25 086	+23 732	11 835	-	11 835	+11 897	+11 897
1985	60 949	26 361	+34 588	12 446	-	12 446	+22 142	+22 142
1986	70 236	27 751	+42 485	11 654	-	11 654	+30 831	+30 831
1987	78 531	29 059	+49 472	12 192	-	12 192	+37 280	+37 280
1988	85 210	30 448	+54 762	12 788	-	12 788	+41 974	+41 974
1989	89 755	30 932	+58 823	13 320	-	13 320	+45 503	+45 503
1990	92 811	31 602	+61 209	13 797	-	13 797	+47 412	+47 412
1991	94 466	31 964	+62 502	13 901	-	13 901	+48 601	+48 601
1992	95 419	32 233	+63 186	14 120	-	14 120	+49 066	+49 066
1993	95 874	32 459	+63 415	13 956	-	13 956	+49 459	+49 459
1994	95 999	32 590	+63 409	14 083	-	14 083	+49 326	+49 326
1995	95 757	32 647	+63 110	14 101	-	14 101	+49 009	+49 009
1996	95 497	32 697	+62 800	14 123	-	14 123	+48 677	+48 677
1997	95 260	32 677	+62 583	14 058	-	14 058	+48 525	+48 525
1998	95 053	32 664	+62 389	14 228	-	14 228	+48 161	+48 161

ommodate measures to secure a reasonable return to Government on development investments;

- a firm basis would be established for several integrated rural development programmes which would be capable of expansion to other parts of the Study Area and possibly Sarawak.

The returns to this programme may be compared to developments in other parts of Sarawak and Malaysia bearing in mind that the following items have been included to apply in the analysis:-.

(a) labour has been valued at its opportunity cost which, depending on the situation, has been assumed at $3 per man day or the value of subsistence earnings displaced;

(b) all export duties have been excluded from the analysis and output has been valued at border parity or world prices. Generally the prices of major export commodities have been estimated on a conservative basis and higher returns may be achieved;

(c) no provision has been made for general infrastructure costs but all direct costs of roads, transport and housing required for the developments have been included in the analysis;

(d) no provision has been made for the residual value of the assets created by the investments under the programme although these would be considerable.

In overall terms the return to the programme is regarded as satisfactory since it exceeds the opportunity cost of capital by four per cent and the surplus earned by the development would be $43 mn over the 25 years.

APPENDIX I

APPENDIX I

THE ALTERNATIVE DEVELOPMENT PATTERN FOR THE NIAH-SUAI DETAILED PLAN AREA

This Appendix discusses the agronomic implications involved in the conflict of interests concerning the land block Igang and the possible alternative development pattern.

The recommended development and cropping patterns for the Detailed Plan Area are shown on Map No. 20, enclosed in the Map Folder. The development pattern, which allocates Igang land block to agriculture and eliminates part of the existing forestry research is diagrammatically illustrated in Figure 6.2 in Chapter 6, and relevant information is summarised in Table I.1. The preferred alternative development pattern, which excludes Igang and leaves all forestry research intact, is similarly illustrated in Figure I.1 and equivalent information is presented in Table I.2. The Kabatu area is excluded from both tables because the development alternative would not affect that land block. The changes involved, if the alternative development pattern is adopted by Government, are discussed in the following Sections.

I.1 TOTAL ACREAGES

In the alternative the total crop area developed by SLDB would be reduced by about 4 000 net acres, made up of 2 600 acres

TABLE I.1 RECOMMENDED SETTLEMENT PATTERN INCLUDING IGANG LAND BLOCK

Sub-scheme in land block	Public sector schemes									Private investor development	
			Crop areas							Crop area	
	Type of sub-scheme	Total number of settler/worker families	Oil palm (net acres)	Rubber (net acres)	Cocoa (net acres)	Rice (net acres)	Total (net acres)	equivalent gross acres	Village and town areas (gross acres)	Total gross acres	Net acres	equivalent gross acres
Galasah	Small-holder settlement	162	1 560	495	315	160	2 530	2 810	245	3 055	Nil	Nil
Sebanah		265	2 385	920	560	265	4 130	4 590	400	4 990	1 105	1 225
Lamaus		331	3 100	1 260	510	330	5 200	5 780	500	6 280	Nil	Nil
Ensabang		318	3 490	1 270	Nil	300	5 060	5 620	500	6 120	855	950
Telabit		268	2 455	1 370	160	180	4 165	4 630	400	5 030	Nil	Nil
Total for small-holder sub-schemes		1 344	12 990	5 315	1 545	1 235	21 085	23 430	2 045	25 475		
Igang	Public estate	220	3 245	370	Nil	Nil	3 615	4 020	580	4 600	Nil	Nil
Sawai		222	2 620	645	270	Nil	3 535	3 930	Nil	3 930	Nil	Nil
Jatan		403	5 320	770	450	Nil	6 540	7 265	Nil	7 265	Nil	Nil
Totals for public estate		845	11 185	1 785	720	Nil	13 690	15 215	580	15 795	Nil	Nil
Totals for all sub-schemes		2 189	24 175	7 100	2 265	1 235	34 775	38 645	2 625	41 270	1 960	2 175

FIGURE I.1

THE PREFERED ALTERNATIVE DEVELOPMENT PATTERN FOR THE NIAH - SUAI DETAILED PLAN AREA

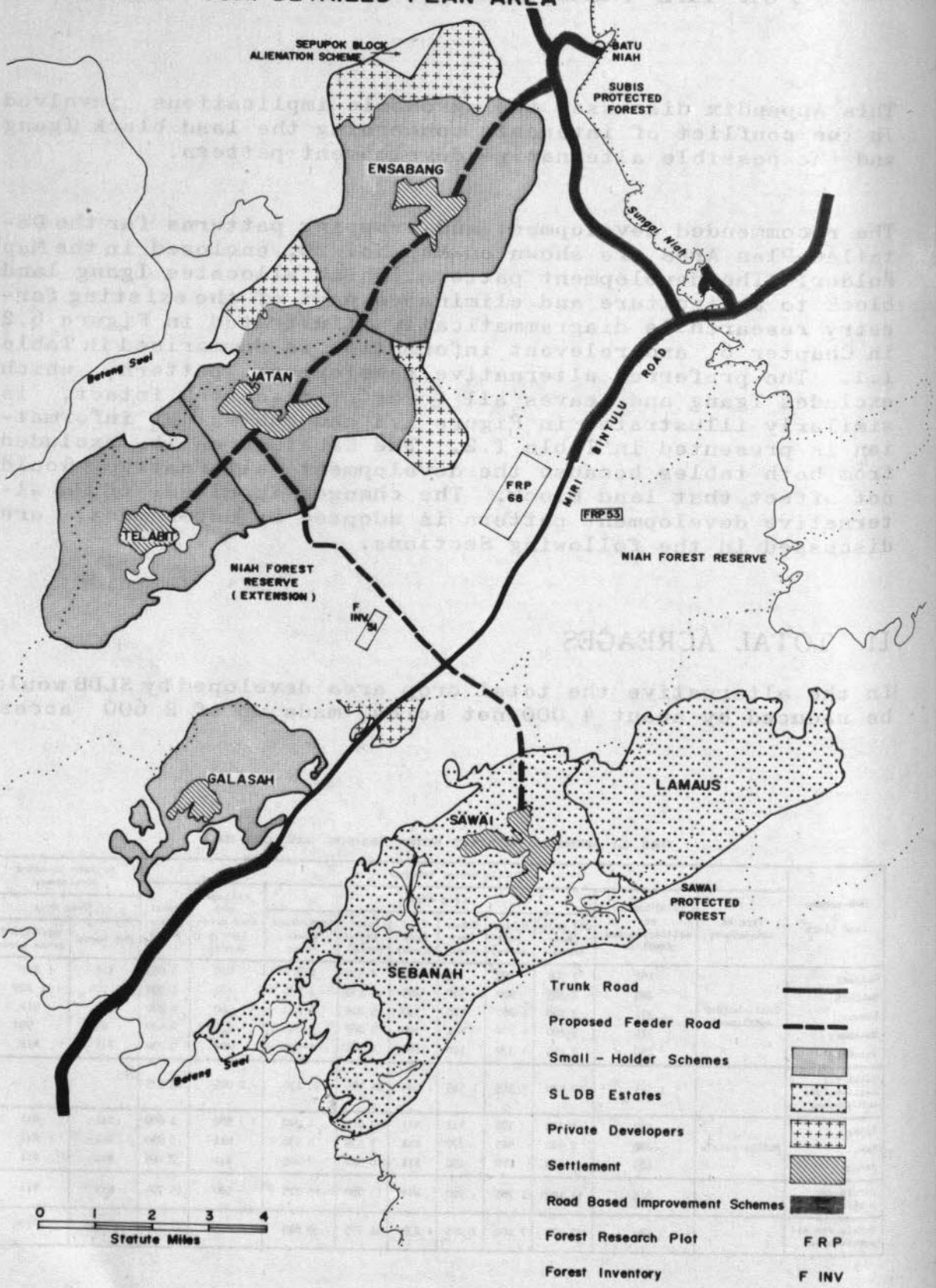


TABLE I.2 ALTERNATIVE CROPPING AND SETTLEMENT PATTERNS EXCLUDING IGANG LAND BLOCK

Sub-scheme in land block	Public sector schemes									Private investor development	
	Type of sub-scheme	Total number of settler/worker families	Crop areas						Village and town areas (gross acres)	Total gross acres	Crop area	
			Oil palm (net acres)	Rubber (net acres)	Cocoa (net acres)	Rice (net acres)	Total (net acres)	equivalent gross acres			Net acres	equivalent gross acres
Galasah	Small-holder settlement	162	1 560	495	315	160	2 530	2 811	245	3 056	495	550
Ensabang		318	3 490	1 270	-	300	5 060	5 622	500	6 122	855	950
Jatan		291	3 140	1 040	155	290	4 625	5 139	435	5 574	1 530	1 700
Telabit		268	2 455	1 370	160	180	4 165	4 628	400	5 028	-	-
Totals for small-holder sub-schemes		1 039	10 645	4 175	630	930	16 380	18 200	1 580	19 780		
Sawai	Public estate	260	3 000	870	275	Nil	4 145	4 606	590	5 196	Nil	Nil
Sebanah		295	3 180	1 185	230	Nil	4 595	5 106	Nil	5 106	Nil	Nil
Lamaus		335	4 750	195	760	Nil	5 705	6 339	Nil	6 339	Nil	Nil
Totals for public estate		890	10 930	2 250	1 250	Nil	14 445	16 051	590	16 641	Nil	Nil
Totals for all sub-schemes		1 929	21 575	6 425	1 895	930	30 825	34 251	2 170	36 421	2 880	3 200

of oil palms, 670 acres of rubber, 370 of cocoa and 300 of rice. There would be an increase in land allocated for private development of about 1 000 gross acres, equivalent to 900 crop acres. Thus, the total crop area reduction would be about 3 000 acres.

The areas required for the villages would be reduced by roughly 450 gross acres, in fact there would be one less small-holder sub-scheme.

I2 SMALL-HOLDER SETTLERS AND EMPLOYMENT

The alternative would result in a reduction of about 300 small-holder families but an increase of about 50 families employed on the public estate.

I3 MANAGEMENT

In the alternative arrangement the public estate would consist of three contiguous land blocks, Sawai, Sebanah and Lamaus. This, from an estate management point of view, would be an advantage over the recommended plan in which the estate would consist of three separate land blocks, Igang, Sawai and Jatan.

For the small-holder sub-schemes the change would make no difference as far as management is concerned. The ADU Centres could be established as required, though only four instead of five would be needed. However, road-based improvement into legally occupied land in Sebanah and Lamaus could not be un-

FIGURE I.2

ALTERNATIVE CROPPING AND SETTLEMENT PATTERNS FOR JATAN AND GALASAH SUB SCHEMES

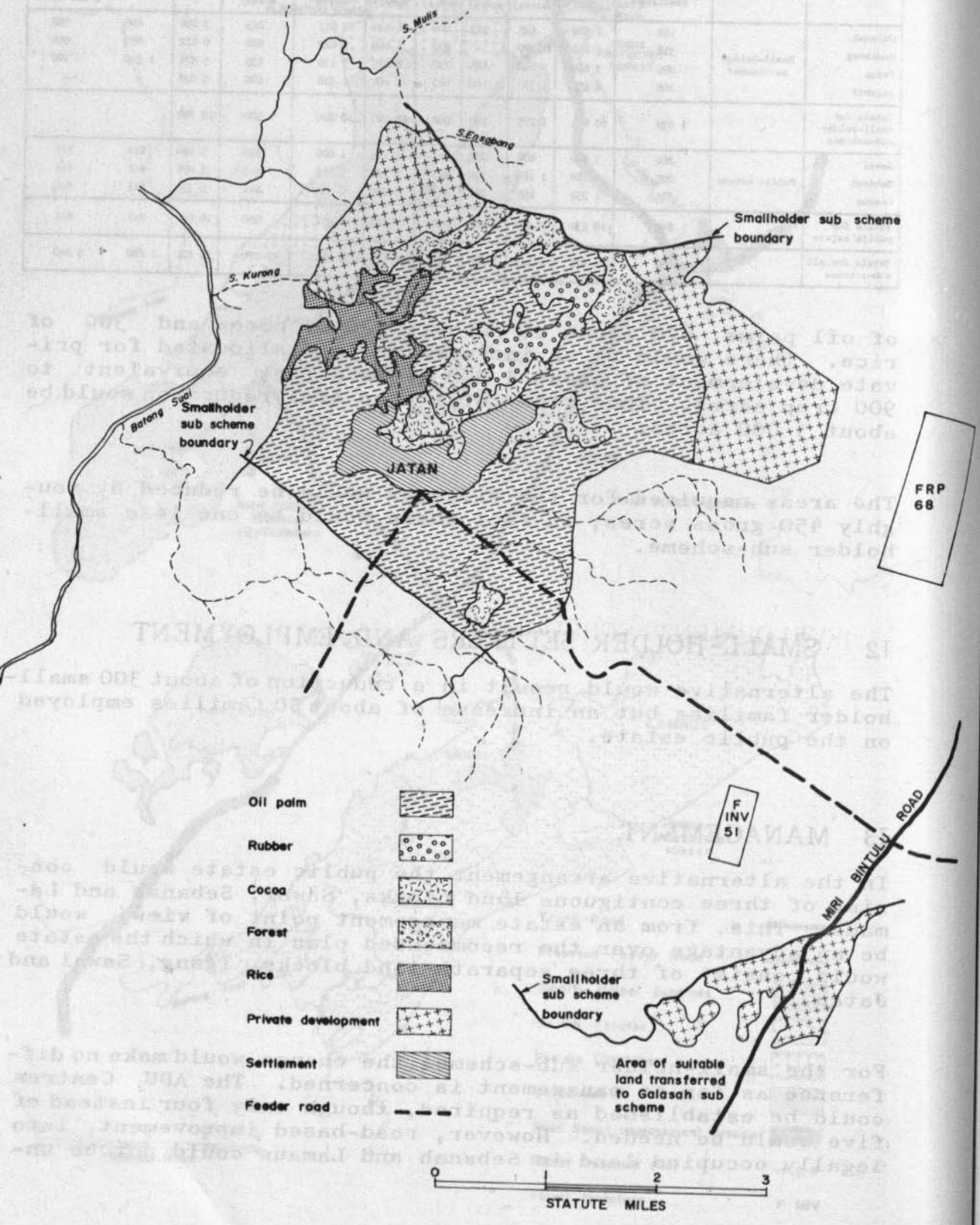
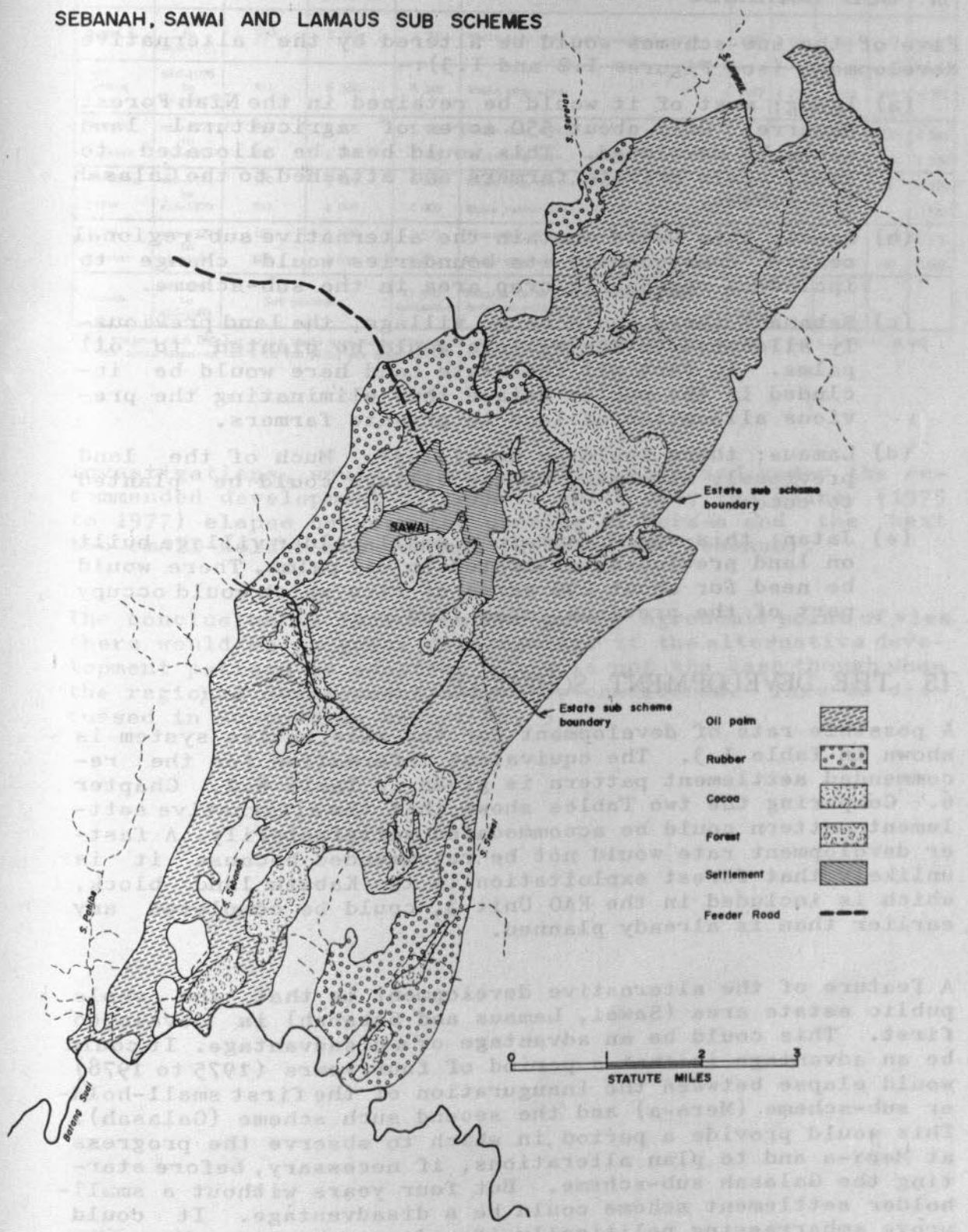


FIGURE I.3

ALTERNATIVE CROPPING AND SETTLEMENT PATTERNS FOR SEBANAH, SAWAI AND LAMAUS SUB SCHEMES



dertaken by the ADU because no Centre would be close enough.

I4 SUB-SCHEMES

Five of the sub-schemes would be altered by the alternative development (see Figures I.2 and I.3):-

(a) Igang; most of it would be retained in the Niah Forest Reserve. Only about 550 acres of agricultural land would be developed. This would best be allocated to small scale private farmers and attached to the Galasah sub-scheme.

(b) Sawai; this would contain the alternative sub-regional centre, consequently its boundaries would change to include a reasonable crop area in the sub-scheme.

(c) Sebanah; there would be no village, the land previously allocated to the village would be planted to oil palms. In fact all the State Land here would be included in the public estate thus eliminating the previous allocation of land to private farmers.

(d) Lamaus; there would be no village. Much of the land previously allocated to the village could be planted to cocoa.

(e) Jatan; this would contain a small-holder village built on land previously allocated to oil palms. There would be need for about 290 acres of rice which would occupy part of the previous cocoa land.

I.5 THE DEVELOPMENT SCHEDULE

A possible rate of development for the alternative system is shown in Table I.3. The equivalent information for the recommended settlement pattern is given in Table 6.2, Chapter 6. Comparing the two Tables shows that the alternative settlement pattern could be accommodated satisfactorily. A faster development rate would not be recommended because it is unlikely that forest exploitation in the Kabatu land block, which is included in the FAO Unit 3, could be completed any earlier than is already planned.

A feature of the alternative development is that the whole public estate area (Sawai, Lamaus and Sebanah) is developed first. This could be an advantage or a disadvantage. It could be an advantage in that a period of four years (1975 to 1978) would elapse between the inauguration of the first small-holder sub-scheme (Mera-a) and the second such scheme (Galasah). This would provide a period in which to observe the progress at Mera-a and to plan alterations, if necessary, before starting the Galasah sub-scheme. But four years without a small-holder settlement scheme could be a disadvantage. It could prove embarrassing politically if, after starting Mera-a, there is an increased demand for similar schemes. Such a demand, which appears likely from the Consultants' sociological

TABLE I.3 POSSIBLE ALTERNATIVE SLDB DEVELOPMENT PROGRAMME WHICH EXCLUDES IGANG LAND BLOCK

Sub-scheme	Land clearing (gross acres)					Planting (net acres)				Total
	Period	For village site	For agriculture	Total	Remarks	Year	Oil palms	Rubber	Cocoa	
Sawai	mid-1975 to mid-1976	590	3 420	3 705	Whole crop area + sub-regional centre.	1976	3 000	870	275	4 145
Lamaus	mid-1976 to mid-1977	Nil	6 340	6 340	Whole crop area.	1977	4 750	195	760	5 705
Sebanah	mid-1977 to mid-1978	Nil	5 105	5 105	Whole crop area.	1978	4 740	1 185	230	4 595
Galasah		245	2 810	3 055	Whole crop area + village.		1 560	495	315	2 370
Ensabang	mid-1978 to mid-1979	500	5 625	6 125	Whole crop area + village.	1979	3 490	1 270	-	3 865
Jatan		Nil	2 000	2 000	Whole rubber area + 845 of oil palm area.		760	1 040	-	1 800
Jatan	mid-1979 to mid-1980	435	3 140	3 575	Remainder of crop area + village.	1980	2 380	-	155	2 535
Telabit		400	4 630	5 030	Whole crop area + village.		2 455	1 370	160	3 985
Kabatu	mid-1980 to mid-1983	Not planned		21 500 estimated	Details to be planned following semi-detailed soil surveys.	1981 to 1983	*			

* A minimum of 6 865 net acres would have to be planted to oil palms in Kabatu during 1981, 1982 and 1983 to make a total of 30 000 net acres required for a 60 ton (ffb) per hour factory in the Niah Suai RDA.

investigations, would be more easily satisfied under the recommended development pattern in which only two years (1975 to 1977) elapse between the opening of Mera-a and the next two small-holder sub-schemes (Galasah and Sebanah).

The conclusion is that from the purely agronomic point of view there would be no great disadvantage if the alternative development pattern is adopted. This is not the case though when the regional development aspect is considered. This is discussed in Supporting Report No. 5.

APPENDIX II

APPENDIX II

CROP PROCESSING

II.1 INTRODUCTION

Provision of processing facilities to handle the output of tree crops forms an integral part of the recommended agricultural development plan. The size, location and phasing of these facilities have been related to the areas of each crop and the rate at which output of raw material would be built up.

In the final analysis the high capital investment involved in establishing oil palm, rubber and cocoa plantations would be justified only if efficient processing facilities could ensure that the highest possible quality of final products would be achieved. Moreover, to remain competitive on the world market for these commodities, it is important that high standards are achieved at lowest unit costs. These objectives can only be attained by a close integration of production and processing operations.

The present study of crop processing requirements has been confined to developments proposed for implementation during the Action Programme period 1975 to 1981. Rounding-off of development units commenced during this period has been allowed for.

II.2 OIL PALMS

SOP and SLDB have already developed 19 000 acres and are committed to establish a further 26 000 acres over the next two to three years in the Lambir-Subis development area. Two mills with initial capacities of 10 and 30 tons per hour respectively have already been planned to serve this acreage in 1974 and 1976 respectively. Eventual capacities will be 20 and 60 tons per hour with possibilities for expansion.

The location of these two factories is such that they can provide facilities to some of the areas recommended for oil palm planting under the agricultural plan and their capacity has therefore been taken into account in this study. This is particularly true of road-based and private investor schemes, although it must be stressed that some uncertainty is attached to the actual rate of development likely to be achieved under these schemes and no commitment is implied to either entrepreneur to accept fruit from these areas except on a mutually agreed basis.

II.2.1 Planning Criteria

In estimating the mill capacities and phasing required to serve the areas planned for development, a number of planning parameters have been taken into account. They are as follows:-

(a) that yields of fresh fruit bunches (ffb) would rise to a peak of nine tons per acre on SLDB and private investor schemes and 7.5 tons per acre on road-based schemes nine years from planting. These levels would be maintained for three years and then decline slowly as shown in Table II.1;

(b) that the peak month production of plantations would amount to 12.5 per cent of annual output and mill capacity must be capable of handling this quantity of fruit;

(c) that mill hours operated during peak months would be 550 hours but normally would be 450 hours per month;

(d) that mill press capacities would be installed in units of either 10 or 15 tons per hour or multiples thereof. For this exercise ten tons per hour has been used.

TABLE II.1 ESTIMATED OIL PALM YIELDS - TONS F F B PER ACRE

SCHEME TYPE	Years from planting																						
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Public sector settlement and private investor schemes	0.5	3.6	6.1	7.7	8.5	8.8	9.0	9.0	9.0	8.9	8.8	8.6	8.5	8.3	8.2	8.0	7.8	7.8	7.7	7.7	7.6	7.6	7.5
Road based improvement schemes	0.4	3.1	5.2	6.6	7.2	7.5	7.7	7.7	7.7	7.6	7.5	7.3	7.2	7.1	7.0	6.8	6.7	6.7	6.6	6.6	6.5	6.5	6.4

On the basis of these parameters it has been estimated that a mill with 60 tons per hour capacity would serve 30 000 acres of oil palms at the higher yield level, or 35 000 acres at the lower yield level.

II.2.2 Mill Site Criteria

Suitable sites have to be carefully chosen for oil palm mills if they are to operate efficiently and economically, and with a minimum of interference to human and wild life populations in their neighbourhood. The following factors need to be taken into account:-

(a) a reliable supply of water of suitable quality is essential. Water requirements vary from one to two tons of water per ton of ffb processed. Quality should be such that with treatment the water can be used in steam boilers;

(b) transport distances and costs of ffb oil and kernels haulage should be minimised, they are of primary economic significance. A major factor involved in the cost of transporting the processed products would be the location of bulk handling facilities. In the agricultural plan a maximum distance for ffb transport

would be 20 to 25 miles while bulking installation facilities have been assumed to be established at Bintulu;

(c) access to, and the proximity of, an all-weather, preferably sealed black-top road, for oil transport is important to the economics and logistics of oil movement to the bulking installation;

(d) effluent disposal, in terms of current knowledge this requires a safe spillage and/or seepage area or point which will not cause harm to local inhabitants or wildlife. Contamination of water supplies or rivers in particular should be guarded against;

(e) location of settlements in the area, and their position in relation to prevailing winds. Mills produce unpleasant smells, smoke and ash and as a general rule a distance of about one to one-and-a-half miles should be planned as a buffer zone between the mill and the nearest habitation.

Consideration of these factors in the agricultural plan has led to the conclusion that mills should generally be located close to the Miri-Bintulu road, near a large river but within a water catchement area which does not feed directly into the river or into densely settled areas.

II.2.3 Mill Capacity Requirements

For planning purposes the capacities required for each category of the development in an RDA has been calculated separately and aggregated to give the most satisfactory solution to the size and phasing of possible mills in combination with the location of possible sites.

Lambir-Subis RDA

The capacity and output of the existing and previously planned mills and plantations have been taken into account in this area. The estimated production from the whole oil palm area that would be planted if the recommendations for the 1975 to 1981 period are implemented is given in Table II.2. Plantings proposed in the agricultural plan include 1 890 acres of public sector development, 15 300 acres developed by private investors and 5 725 acres under road-based improvement schemes.

For the existing and previously planned public sector schemes the construction of a mill at Ladang Tiga has been mooted; the completion of the first stage with a capacity of 30 tons ffb per hour is scheduled in 1976. To cater for the overall planting programme this mill would require expansion to 60 tons per hour in 1978 and this capacity together with the SOP mill would probably cater for the needs of all the schemes to

TABLE II.2 OIL PALM PROCESSING REQUIREMENTS - LAMBIR SUBIS RDA

Detail	Unit	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Public sector schemes																	
Lambir Subis North	Thous tons ffb	11.9	26.3	46.3	60.4	68.5	72.3	73.9	74.5	74.2	73.7	72.7	71.6	→	→	→	→
Lambir Subis South		2.0	16.9	43.6	106.8	148.6	173.4	185.4	190.1	192.4	192.1	191.1	188.6	→	→	→	→
Total	Thous tons ffb	13.9	43.2	89.9	167.2	217.1	245.7	259.3	264.6	266.6	265.8	263.8	260.2	→	→	→	→
Peak month production	Tons ffb	1 738	5 400	11 238	20 900	27 138	30 713	32 413	33 075	3 325	3 325	32 975	32 525	→	→	→	→
Capacity required																	
When working at 450 hrs/mth	Tons/hr	4.0	12.0	25.0	46.4	60.3	68.3	-	-	-	-	-	-				
550 hrs/mth		-	-	-	38.0	49.3	55.8	58.9	60.1	60.5	60.5	→	→	→	→	→	→
Private investor schemes(1)	Thous tons ffb		-	-	-	.6	6.0	18.3	40.9	66.8	91.3	112.9	126.1	133.1	136.1	136.8	
Road based development			-	-	.2	1.7	5.6	10.3	15.7	21.2	27.3	34.5	39.3	42.0	43.1	43.4	
Total	Thous tons ffb				.2	2.3	11.6	28.6	56.6	88.0	118.6	147.4	165.4	175.1	179.2	180.2	
Peak month production	Tons ffb					288	1 450	3 575	7 075	11 000	14 825	18 425	20 675	21 888	22 400	22 525	
Capacity required																	
When working at 450 hrs/mth	Tons/hr					1.0	3.2	7.9	15.7	24.4	32.9	40.9	45.9	48.6	49.7	50.0	
550 hrs/mth						.5	2.6	6.5	12.9	20.0	27.0	33.5	37.6	39.8	40.7	40.9	
Overall total capacity required	Tons/hr	4.0	12.0(2)	25.0(2)	46.6(2)	50	58	65	73	81	88	94	98	100	101	101	
Overall total capacity proposed		-(3)	30	30	60	60	60	60	80	80	100	100	100	100	100	100	

Notes (1) Excludes production at Sarawak Oil Palms.
(2) Assuming 450 hours worked in peak months, thereafter 550 hours.
(3) Assume ffb processed in SOP factory.

1981. However, the position would require review in 1982. Output from private investor schemes, if schemes of a large size had by then been developed in the Ulu Klad area, may require additional capacity of about 30 tons per hour; two stages of 10 and 20 tons per hour in 1982 and 1984 respectively.

A summary of the possible mill developments is as follows:-

Location:	SOP		Subis		Ulu Klad { Private investor	
Developed by:	SOP		SLDB			
Capacity:	Year	t/h	Year	t/h	Year	t/h
Initial stage	1974	10	1976	30	1982	10
Second stage	?	10	1978	30	1984	10
Third stage	-		1982	10		-
Possible ultimate capacity		20		70		20

Note t/h = tons per hour

Niah-Suai RDA

The proposed plantings in this RDA are 22 380 acres under Public Sector schemes developed by SLDB by 1980 with a further 6 620 acres to round off the area in Kabatu in 1981 to 1982, 4 500 acres of road-based improvement and 4 330 acres under private investors. The estimated production from these areas and processing capacity requirements are summarised in Table II.3.

An SLDB developed mill of 60 tons per hour capacity would be needed at Igang to serve the public sector schemes. This mill should also cater for the needs of private investor and road-based development schemes when these are developed, their needs would be catered for by an expansion to the mill of 10 or 20 tons per hour. Phasing of the Igang mill development

TABLE II.3 OIL PALM PROCESSING REQUIREMENTS - NIAH-SUAI RDA

Detail	Unit	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Public sector schemes	Thous tons ffb	1.6	11.7	21.1	34.5	46.3	69.0	91.6	115.6	130.7	138.0	141.6	142.0	142.0
SLDB schemes			2.0	15.5	35.5	60.9	81.1	98.0	108.4	113.4	115.9	116.2	115.8	114.4
Small holder schemes														
Total	Thous tons ffb	1.6	13.7	36.6	70.0	107.3	150.1	190.6	224.0	244.1	253.9	257.8	257.8	256.4
Peak month tonnage	Tons ffb		1 706	4 578	8 748	13 408	18 764	23 826	27 995	30 513	31 739	32 224	32 229	32 046
Capacity required														
When working at 450 hrs/mth	Tons/hr		3.8	10.2	19.4	29.8	41.7	52.9	62.2	67.8	70.5	71.6	71.6	71.2
550 hrs/mth			-	-	-	-	-	43.3	50.9	55.5	57.7	58.6	58.6	58.6
Private investor schemes	Thous tons ffb	-	-	.5	4.0	10.2	18.2	24.7	30.0	33.7	36.3	37.9	38.4	38.5
Road based schemes		.2	1.4	3.0	6.0	9.5	14.1	19.8	26.2	30.5	32.8	33.8	34.1	34.2
Total	Thous tons ffb	.2	1.4	3.5	10.0	19.7	32.3	44.5	56.2	64.2	69.1	71.7	72.5	72.7
Peak month tonnage	Tons ffb	Neg	175	438	1 250	2 463	4 038	5 563	7 025	8 025	8 638	8 963	9 063	9 067
Capacity required														
When working at 450 hrs/mth	Tons/hr		.4	1.0	2.8	5.5	9.0	12.4	15.6	17.8	19.2	19.9	20.1	20.2
550 hrs/mth		-	-	-	-	-	-	10.1	12.8	14.6	15.7	16.3	16.5	16.5
Overall total capacity required	Tons/hr	-2(1)	4(1)	11(1)	22(1)	35(1)	51(1)	53	63	70	73	75	75	75
Overall total capacity proposed		- (2)	30	30	30	30	60	60	60	70	70	70	70	70

Notes (1) Assuming 450 hours worked in peak months; thereafter 550 hours.
(2) Assume ffb processed in Lambir Subis mill.

would then be as follows:-

- Initial stage, 30 tons per hour in 1979;
- Second stage, 30 tons per hour in 1983;
- Third stage, 10 tons per hour in 1986.
- Possible ultimate capacity, 70 tons per hour.

II.2.4 Bulking Installation Facilities

The bulking installation facilities required to serve the needs of the presently planted and planned future plantings in both the public sector and private investor schemes are an important element of the oil palm development programme. SLDB are at present (1974) establishing a small installation at Miri to provide facilities for the SOP mill output and in due course, for their own Subis mill. This arrangement will probably suffice until about 1980. But the long term developments proposed in this Report envisage considerable expansion of the tonnage of oil and kernels to be handled as shown in Table II.4.

TABLE II.4 ESTIMATED QUANTITIES OF PALM OIL AND KERNELS AVAILABLE FOR EXPORT - THOUSAND TONS

	1980	1985	1990
Palm oil			
Lambir-Subis	49.14	52.76	52.04
Niah-Suai	5.04	39.78	46.20
Total	54.18	92.54	98.24
Palm kernels			
Lambir-Subis	9.83	10.55	10.40
Niah-Suai	0.94	7.85	9.24
Total	10.77	18.40	19.64

Handling these tonnages through Miri is not considered to be a practical proposition for the following reasons:-

- logistics problems involved in lightering or barging across the Miri river bar;
- costs of barging or lightering;
- logistics problems in providing adequate loads for larger oil tankers.

The development of a deep water port near Bintulu would provide a solution to these problems but would involve additional transport costs. The port feasibility study which has recently been put in hand by the Sarawak Government is expected to deal with this problem.

II3 RUBBER

The problems of rubber processing are rather less tractable than those for oil palm. There are no large scale processing units in the Study Area, the largest being the RSS factory on the Lambir Rubber Scheme at Tunku Abdul Rahman village with a capacity of about two tons drc per day. The output from all other rubber plantings is processed by manual methods in small scale units into either unsmoked sheets or RSS.

The available statistics give only a poor indication of present production or potential future production. Also the location of planted areas in relation to one another cannot be clearly established. In the absence of better data it is not possible to give firm recommendations for any developments to handle production from existing plantations. There is also some controversy regarding the type of processing unit best suited to deal with small-holder rubber in the context of current market conditions. The general conclusion appears to favour small group processing units turning out unsmoked or smoked sheets at minimum cost and from which farmers benefit by being able to contribute their own labour to the process. Against this must be considered the arduous and unstimulating character of the work involved which amounts to little more than sheer drudgery and is a most unattractive proposition except in the case of necessity or high prices.

The agricultural plan proposes the establishment during the period 1975 to 1980 of some 8 000 acres of rubber by SLDB either for small-holder settlements or as public sector estates. For these areas specific processing recommendations are made and at an appropriate date the possibility of extending these facilities to include the requirements of road-based producers as well as existing and future private plantings should be examined. The advantage of integrating rubber and other processing facilities is already being considered by the SLDB. This possibility should receive more attention in future.

II.3.1 Planning Criteria

Economic analyses indicate the superiority of latex based processing operations over those based on coagulum material and, having regard to the scale of operations a latex based crumb rubber factory is proposed as the basic process facility to be established. However, a final decision need not be taken until nearer the time that production commences.

The size of unit required to serve the areas planned for development to rubber would depend on the following factors:-

(a) rubber yields; the yields assumed in this Study are given in Table II.5 which have a gradual rise to a peak of 1 800 pounds drc per acre 14 years from planting;

(b) plantation production; this would amount to between 10.5 and 10.8 per cent of annual output during the peak months of production (average 10.7 per cent);

(c) factory hours operated during peak months; these are assumed to be 22 hours per day and 15 hours per day during non-peak periods;

(d) capacity of the hammer-mill and drying equipment; usually these would be installed in units with capacities of about 1 500 or 3 300 pounds per hour to match creping and macerator outputs;

(e) latex should be delivered to the factory within six hours of collection from reception centres.

TABLE II.5 ESTIMATED RUBBER YIELDS D R C TONS PER ACRE

SCHEME TYPE	Year from planting							
	7	8	9	10	11	12	13	14 to 30
Public sector settlement and private investor schemes	0.28	0.45	0.56	0.63	0.67	0.71	0.76	0.80
Road based improvement schemes	0.24	0.38	0.48	0.54	0.57	0.61	0.64	0.68

Based on these criteria two possible crumb rubber factory sizes have been defined:-

- a ten ton per day unit which would handle about 2 400 tons per annum produced from about 3 000 acres of plantations;
- a 20 ton per day unit which would handle about 5 500 tons per annum produced from about 7 000 acres of plantations.

In addition, RSS units considered suitable for smaller areas of rubber would be:-

- one ton per day handling 200 tons per annum;
- two tons per day handling 480 tons per annum.

II.3.2 Factory Capacity Requirements

The capacity required to meet the needs of each type of development scheme in the various RDAs have been assessed independently.

For economic analysis it has been assumed that all rubber would be processed in crumb producing units located at suitable sites in the RDAs.

Lambir-Subis RDA

The existing SLDB RSS factory with a 2.5 tons per day capacity is assumed to cater for the complete needs of the Lambir Scheme which covers 1 880 acres. The public sector scheme at Mera-a with 875 acres of rubber is the only new scheme of this kind proposed in the RDA. Peak annual production would not exceed 80 tons per annum. Road-based schemes in the RDA would reach about 6 650 acres which are estimated to produce 4 500 tons when mature, and private investors 4 370 acres with a production potential of 3 500 tons. Details of the estimated build-up of this production are given in Table II.6. The estimated total factory capacity required to handle the output from these sources is 30 tons per day. Due to the location of the potential producing areas this might be provided by two factories with capacities of 20 and 10 tons per day. Possible sites would be near Bukit Peninjau and Sungai Klad (see Figure 4.1 in Chapter 4).

TABLE II.6 RUBBER PROCESSING REQUIREMENTS - LAMBIR SUBIS RDA

Detail	Unit	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Public sector settlement schemes(1)	Tons	145	394	490	551	586	621	665	700	700	700	700	700	700	700	700
Estimated capacity required	Tons/day	1.0	1.6	2.0	2.3	2.4	2.6	2.8	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Private investors	Tons			109	347	844	1 392	1 909	2 415	2 745	2 987	3 179	3 321	3 412	3 469	3 494
Road based improvement			119	475	860	1 328	1 805	2 340	3 073	3 548	3 894	4 106	4 253	4 376	4 463	4 525
Sub-total	Tons		119	584	1 207	2 172	3 197	4 249	5 488	6 293	6 881	7 285	7 574	7 788	7 832	8 019
Estimated capacity required	Tons/day		.5	2.4	5.0	9.1	11.6	15.5	20.0	22.9	25.0	26.5	27.5	28.3	28.5	29.2
Overall total production	Tons	245	513	1 074	1 758	2 758	3 818	4 914	6 188	6 993	7 581	7 985	8 274	8 488	8 532	8 729
Overall total capacity required	Tons/day	1.0	2.1	4.4	7.3	11.5	14.2	18.3	22.9	25.9	27.9	29.4	30.4	31.2	31.4	32.1
Overall total capacity proposed		1	2	10	10	10	20	20	20	30	30	30	30	30	30	30

Note (1) Excluding Lambir Rubber Scheme.

The overall build-up of factory capacity would be as follows:-

	Bukit Peninjau	Sungai Klad
Initial installation	10 tons per day in 1982	10 tons per day in 1983
Second stage	10 tons per day in 1989	-
Ultimate capacity installed	20 tons per day	10 tons per day

Niah-Suai RDA

The public sector schemes proposed for this area include 7 100 acres of rubber with a mature production potential of 5 700 tons. Road-based schemes amount to about 5 200 acres and private investors a further 1 200 acres. The production potential of these developments is estimated at 3 500 and 1 000 tons respectively. Details are given in Table II.7.

TABLE II.7 RUBBER PROCESSING REQUIREMENTS - NIAH-SUAI RDA

Detail	Unit	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993
Public sector settlement schemes	Tons	104	563	1 925	2 023	2 855	3 765	4 360	4 776	5 093	5 332	5 525	5 625
Estimated capacity required	Tons/day	.4	2.3	4.3	8.4	11.4	13.6	15.8	17.4	18.6	19.4	20.0	20.4
Private investors	Tons			79	206	284	515	635	728	812	881	928	956
Road based improvement		119	237	506	784	1 196	1 702	2 317	2 725	2 993	3 186	3 313	3 430
Sub-total production	Tons	119	237	585	990	1 480	2 217	2 952	3 453	3 805	4 067	4 241	4 386
Estimated capacity required	Tons/day	.5	1.0	2.4	4.1	6.2	9.2	11.8	12.6	13.8	14.8	15.4	16.0
Overall total production	Tons	223	790	1 610	3 013	4 335	5 982	7 312	8 229	8 898	9 399	9 766	10 011
Overall total capacity required	Tons/day	9	3.3	6.7	12.5	17.6	22.8	27.6	30.0	32.4	34.2	35.4	36.4
Overall total capacity proposed		10	10	10	20	20	20	30	30	35	35	35	35

To accommodate the production build-up pattern it is proposed that a single factory should be built at Igang with capacity phased as follows:-

- Initial installation - 10 tons per day in 1982;
- Second stage - 10 tons per day in 1985;
- Third stage - 10 tons per day in 1988;
- Fourth stage - 5 tons per day in 1990;
- Ultimate capacity - 35 tons per day.

Miri, Marudi, Long Lama, Labang and Bintulu RDAs

The road-based schemes proposed for the last four RDAs amount to roughly 2 800, 2 500, 2 100 and 2 300 acres respectively, and private investor schemes to about 9 900 acres in Beseduan. The estimated production potential from these areas is given in Table II.8.

The proposed rubber plantings have to be considered in conjunction with existing acreages. Records show that there are some 38 000 acres planted under the Rubber Planting 'A' Scheme; most of it in the Study Area. The potential production is summarised in Table II.9. Much of this rubber is either not being tapped, for the reasons discussed in Part IV, or the latex is already processed in small scale processing units. As a basis for planning the following proportions of the potential production have been considered as available for central factory processing:-

- Miri District 25 per cent;
- Bintulu District 50 per cent;
- Baram District 33 per cent.

TABLE II.8 ESTIMATED RUBBER PROCESSING CAPACITY REQUIREMENTS - MARUDI, LONG LAMA, LABANG, BINTULU RDAs

RDA	Category	Detail	Unit	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Marudi	Road based development	Production	Tons	205	408	663	955	1 187	1 429	1 587	1 715	1 793	1 850	1 892	1 911	1 924
		Capacity required	Tons/day	.9	1.7	2.8	4.0	5.0	6.0	6.6	7.2	7.5	7.7	7.9	8.0	8.0
Long Lama	Road based development	Production	Tons	-	205	408	663	955	1 187	1 351	1 463	1 559	1 618	1 604	1 694	1 703
		Capacity required	Tons/day		0.9	1.7	2.8	4.0	5.0	5.6	6.1	6.5	6.7	7.0	7.1	7.1
Labang	Private investor	Production	Tons				578	1 660	3 062	4 668	5 664	6 321	6 816	7 237	7 577	7 811
	Road based development					205	613	1 071	1 548	2 008	2 305	2 521	2 691	2 816	2 902	2 954	2 982
	Overall	Sub-total production	Tons		205	613	1 649	3 208	5 070	6 973	8 185	9 012	9 632	10 139	10 531	10 793
		Capacity required	Tons/day		0.9	2.6	6.9	11.7	18.4	25.4	29.8	32.8	35.0	36.9	38.3	39.3
Bintulu	Road based development	Production	Tons	205	408	663	885	1 053	1 214	1 322	1 419	1 473	1 512	1 533	1 544	1 550
		Capacity required	Tons/day	0.9	1.7	2.8	3.7	4.4	5.1	5.5	6.0	6.1	6.3	6.4	6.4	6.5
Overall total production			Tons	410	1 226	2 347	4 152	6 403	8 900	11 233	12 782	13 837	14 612	15 228	15 680	15 970
Overall total capacity required			Tons/day	1.8	5.2	9.9	17.4	25.1	34.5	43.1	49.1	52.9	55.7	58.2	59.8	60.9

TABLE II.9 ESTIMATED PROCESSING CAPACITY REQUIREMENTS FOR EXISTING RUBBER PLANTATIONS IN MIRI, BINTULU AND BARAM DISTRICTS

District	Detail	Unit	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Miri	Production RPS(1)	Tons	993	1 096	1 199	1 224	1 227	1 023	995	965	930	895	862
	Non RPS		330	360	390	400	400	340	330	320	310	290	290
	Total	Tons	1 323	1 356	1 589	1 624	1 627	1 363	1 325	1 285	1 240	1 185	1 152
	Estimated capacity required	Tons/day	5.5	5.7	6.6	6.8	6.8	5.7	5.5	5.4	5.2	4.9	4.8
Bintulu	Production RPS	Tons	2 491	2 766	2 964	3 017	1 006	2 451	2 381	2 309	2 228	2 148	2 062
	Non RPS		830	920	990	1 000	1 000	820	790	770	740	710	690
	Total	Tons	3 321	3 686	3 954	4 017	4 006	3 271	3 171	3 079	2 968	2 858	2 752
	Estimated capacity required	Tons/day	12.1	13.4	14.4	14.6	14.6	11.9	11.5	11.2	10.8	10.4	10.0
Baram	Production RPS	Tons	1 941	2 080	2 165	2 159	2 131	1 589	1 541	1 492	1 434	1 379	1 328
	Non RPS		650	690	720	720	710	520	510	490	470	460	440
	Total	Tons	2 591	2 770	2 885	2 879	2 841	2 109	2 051	1 982	1 904	1 839	1 768
	Estimated capacity required	Tons/day	9.4	10.1	10.5	10.5	10.3	8.8	8.5	8.2	7.9	7.7	7.4
Overall total production		Tons	7 235	7 812	8 428	8 520	8 474	6 743	6 547	6 346	6 112	5 882	5 672
Overall total capacity required		Tons/day	26.0	28.0	30.0	30.0	30.0	24.0	24.0	24.0	22.0	21.0	21.0

Note (1) Rubber Planting Scheme.

Consolidating the production from all sources the following possible processing capacities might be required in the particular RDAs:-

	Tons per day			
Year	Marudi	Long Lama	Beseduan	Bintulu
1975	3.0	-	-	6.0
1980	3.0	-	-	6.0
1985	5.0	5.0	5.0	7.5
1990	10.0	5.0	30.0	11.0
1995	10.0	7.5	40.0	11.0

The quantity of rubber available at Miri does not appear to justify setting up a plant in this RDA. However, in the other RDAs the possibility should be seriously considered. But before setting up units at either Marudi or Bintulu it is recommended that detailed surveys be carried out to establish more accurately the likely present production and the need for additional processing capacity to that which already exists.

II.4 COCOA

Samoan-type driers with box fermentation of beans is proposed as the basic type of unit for cocoa processing since these are best suited to the requirements of relatively small dispersed areas of production. Larger scale operations might, however, be set up to serve larger compact plantings when the success of cocoa production is firmly established. Several proven commercially produced drying units are available.

II.4.1 Planning Parameters

The number of Samoan-type driers required to serve the areas planned for cocoa development have been calculated on the basis of the area served by a single unit. The parameters involved are as follows:-

(a) yields per acre of raw beans or their equivalent in terms of dry beans; yield estimates are given in Part IV. For planning purposes in this exercise the yields which have been assumed are 0.67 tons per acre on public sector and private investor schemes, and 0.57 tons on road-based schemes;

(b) the pattern of harvesting; this has been estimated for Sarawak to be spread over 42 weeks of the year;

(c) drier capacity; the standards used here are 1.8 to 2.0 tons dbe per week based on a floor area of about 300 square feet;

(d) peak month production; up to 30 per cent of annual yield has been assumed.

Based on these parameters a drier would serve an area of about 40 acres in full production on public sector and private schemes and 50 acres of road-based improvement schemes.

II.4.2 Dryer Requirements

The estimated requirements of schemes in each RDA based on the acreages of crop planted in each are given in Tables II.10,

TABLE II.10 COCOA DRYER REQUIREMENTS - LAMBIR SUBIS RDA

Scheme/Detail		1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Public sector settlement schemes	acres in bearing	120									
	number of dryer units	1	3	3							
Private sector schemes	acres in bearing			375	595	1 415					
	number of dryer units			5	12	25	35				
Road based improvement schemes	acres in bearing		475	1 335							
	number of dryer units		5	11	27						
Total number of dryer units required		1	8	19	42	55	65				

TABLE II.11 COCOA DRYER REQUIREMENTS - NIAH SUAI RDA

Scheme/detail	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988
Public sector settlement schemes — acres in bearing		875	1 655	1 655	2 105	2 265	→	→	→	→
Public sector settlement schemes — number of dryer units		11	31	41	47	55	57	→	→	→
Private sector schemes — acres in bearing			400	→	→	→	→	→	→	→
Private sector schemes — number of dryer units			5	10	→	→	→	→	→	→
Road based improvement schemes — acres in bearing	755	755	755	755	960	1 020	1 045	→	→	→
Road based improvement schemes — number of dryer units	7	15	15	15	17	19	21	→	→	→
Total number of dryer units required	7	26	51	66	74	84	88	→	→	→

TABLE II.12 COCOA DRYER REQUIREMENTS - MARUDI, LONG LAMA, LABANG AND BINTULU RDAs

RDA	Scheme/Detail	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
Marudi	Road based improvement schemes — acres in bearing	350	→	→	→	→	→	→	→	→	→	→	→
Marudi	Road based improvement schemes — number of dryer units	3	7	→	→	→	→	→	→	→	→	→	→
Long Lama	Road based improvement schemes — acres in bearing		305	→	→	→	→	→	→	→	→	→	→
Long Lama	Road based improvement schemes — number of dryer units		3	6	→	→	→	→	→	→	→	→	→
Labang	Private investor schemes — acres in bearing				3 535	4 235	→	→	→	→	→	→	→
Labang	Private investor schemes — number of dryer units				44	97	106	→	→	→	→	→	→
Labang	Road based improvement schemes — acres in bearing			525	→	→	→	→	→	→	→	→	→
Labang	Road based improvement schemes — number of dryer units			5	11	→	→	→	→	→	→	→	→
Bintulu	Road based improvement schemes — acres in bearing	280	→	→	→	→	→	→	→	→	→	→	→
Bintulu	Road based improvement schemes — number of dryer units	3	6	→	→	→	→	→	→	→	→	→	→
Total number of dryer units required		6	16	24	74	127	136	→	→	→	→	→	→

II.11 and II.12.

In all 289 driers would need to be established by 1985. The phasing of their construction would be as follows:-

Year	Number of driers
1978	1
1979	14
1980	36
1981	58
1982	36
1983	68
1984	63
1985	13

APPENDIX III

TABLE III.1 SMALL-HOLDER FARM TYPE (a) DEVELOPMENT COSTS $

Year of scheme	0	1	2	3	4	Total
Development costs:						
Land development: (including labour)						
Oil palm (9 acres)	837	1 543	68	1 202	194	3 844
Rubber (6 acres)	594	838	22	22	22	1 498
Rice (1 acre)	93	573	383	33	33	1 115
Sub-total	1 524	2 954	473	1 257	249	6 457
Crop production: (including labour)						
Oil palm	77	1 979	1 256	1 605	2 118	7 035
Rubber		1 233	915	729	672	3 549
Cocoa						
Rice						
Sub-total	77	3 212	2 171	2 334	2 790	10 584
SLDB management costs	906	1 276	1 002	1 307	814	5 305
Net revenue from sales: Oil palm (1)				341	2 352	2 693
Development loan:						
With interest at 7 per cent						
Balance	2 507	7 442	3 646	4 557	1 501	
Development cost c/f		2 682	10 833	15 492	21 452	
Cumulative cost	2 507	10 124	14 479	20 049	22 953	
Interest at 7 per cent	175	709	1 013	1 403	1 607	
New cumulative total	2 682	10 833	15 492	21 452	24 560	
Alternative with interest at 2 per cent						
Balance	2 507	7 442	3 646	4 557	1 501	
Development cost c/f		2 557	10 198	14 120	19 050	
Cumulative cost	2 507	9 999	13 844	18 677	20 551	
Interest at 2 per cent	50	199	276	373	411	
New cumulative total	2 557	10 198	14 120	19 050	20 962	
Settler income:						
Production labour at $5						
Oil palm	76	837	581	855	1 183	
Rubber		1 041	693	504	402	
Total labour payments	76	1 878	1 274	1 359	1 585	
Net income from rice			180	220	275	
Net income from homestead plot			100	100	200	
Total settler income	76	1 878	1 554	1 679	2 060	

Note (1) Excluding duty and processing, transport and distribution.

TABLE III.2 SMALL-HOLDER FARM TYPE (b) DEVELOPMENT COSTS $

Year of scheme	0	1	2	3	4	Total
Development costs:						
Land development: (including labour)						
Oil palm (10 acres)	930	1 714	76	1 336	216	4 272
Rubber (5 acres)	495	698	18	18	18	1 247
Rice (1 acre)	93	573	383	33	33	1 115
Sub-total	1 518	2 985	477	1 387	267	6 634
Crop production: (including labour)						
Oil palm	85	2 199	1 396	1 783	2 353	7 816
Rubber		1 228	763	608	560	3 159
Cocoa						
Rice						
Sub-total	85	3 427	2 159	2 391	2 913	10 975
SLDB management costs	485	1 182	1 010	1 357	809	
Net revenue from sales: Oil palm (1)				379	2 613	2 992
Development loan:						
Balance	2 088	7 594	3 646	4 756	1 376	
Development cost c/f		2 234	10 516	15 153	21 303	
Cumulative cost	2 088	9 828	14 162	19 909	22 679	
Interest at 7 per cent	146	688	991	1 394	1 588	
New cumulative total	2 234	10 516	15 153	21 303	24 267	
Settler income:						
Production labour at $5						
Oil palm	85	930	645	950	1 315	
Rubber		868	578	420	335	
Total labour payments	85	1 798	1 223	1 370	1 650	
Net income from rice			180	220	275	
Net income from homestead plot			100	100	200	
Total settler income	85	1 798	1 503	1 690	2 125	

Note (1) Excluding duty and processing, transport and distribution.

TABLE III.3 SMALL-HOLDER FARM TYPE (c) DEVELOPMENT COSTS $

Year of scheme	0	1	2	3	4	Total
Development costs:						
Land development:						
(including labour)						
Oil palm (11 acres)	1 023	1 855	84	1 470	258	4 690
Rubber (4 acres)	396	558	14	14	14	996
Rice (1 acre)	93	573	363	33	33	1 115
Sub-total	1 512	2 986	481	1 517	305	6 801
Crop production:						
(including labour)						
Oil palm	94	2 419	1 536	1 961	2 588	8 598
Rubber		982	610	486	448	2 526
Cocoa						
Rice						
Sub-total	94	3 401	2 146	2 447	3 036	11 124
SLDB management costs	464	1 088	1 017	1 406	803	
Net revenue from sales:						
Oil palm (1)				417	2 874	3 291
Development loan:						
Balance	2 070	7 475	3 644	4 953	1 250	
Development cost c/f	-	2 215	10 368	14 993	21 342	
Cumulative cost	2 070	9 690	14 012	19 946	22 592	
Interest at 7 per cent	145	678	981	1 396	1 581	
New cumulative total	2 215	10 368	14 993	21 342	24 173	
Settler income:						
Production labour at $5						
Oil palm	94	1 023	710	1 045	1 447	
Rubber		694	462	336	268	
Total labour payments	94	1 717	1 172	1 381	1 715	
Net income from rice			180	220	275	
Net income from homestead plot			100	100	200	
Total settler income	94	1 717	1 452	1 701	2 190	

Note (1) Excluding duty and processing, transport and distribution.

TABLE III.4 SMALL-HOLDER FARM TYPE (d) DEVELOPMENT COSTS $

Year of scheme	0	1	2	3	4	Total
Development costs:						
Land development: (including labour)						
Oil palm (10 acres)	930	1 714	76	1 336	216	4 272
Cocoa (4 acres)	258	826	40	532	124	1 780
Rice (1 acre)	93	573	383	33	33	1 115
Sub-total	1 281	3 113	499	1 901	373	7 167
Crop production: (including labour)						
Oil palm	85	2 199	1 396	1 783	2 353	7 816
Rubber*						
Cocoa		617	1 061	976	777	3 431
Rice						
Sub-total	85	2 816	2 457	2 759	3 130	11 247
SLDB management cost	439	1 041	947	1 299	751	
Net revenue from sales:						
Oil palm (1)				379	2 613	2 992
Cocoa					890	890
Development loan:						
Balance	1 805	6 970	3 903	5 580	751	
Development cost c/f		1 931	9 524	14 367	21 343	
Cumulative cost	1 805	8 901	13 427	19 947	22 094	
Interest at 7 per cent	126	623	940	1 396	1 547	
New cumulative total	1 931	9 524	14 367	21 343	23 641	
Settler income:						
Production labour at $5						
Oil palm	85	930	645	950	1 315	
Cocoa		254	746	614	458	
Total labour payments	85	1 184	1 391	1 564	1 773	
Net income from rice			180	220	275	
Net income from homestead plot			100	100	200	
Total settler income	85	1 184	1 671	1 884	2 248	

Note (1) Excluding duty and processing, transport and distribution.

TABLE III.5 SMALL-HOLDER FARM TYPE (e) DEVELOPMENT COSTS $

Year of scheme	0	1	2	3	4	Total
Development costs:						
Land development: (including labour)						
Oil palm (9 acres)	837	1 543	68	1 202	194	3 844
Cocoa (5 acres)	323	1 032	50	665	155	2 225
Rice (1 acre)	93	573	383	33	33	1 115
Sub-total	1 253	3 148	501	1 900	382	7 184
Crop production: (including labour)						
Oil palm	77	1 979	1 256	1 605	2 118	7 035
Rubber						
Cocoa		771	1 327	1 221	971	4 290
Rice						
Sub-total	77	2 750	2 583	2 826	3 089	11 325
SLDB management cost	460	1 135	940	1 250	756	
Net revenue from sales:						
Oil palm (1)				341	2 352	2 693
Cocoa					1 113	1 113
Development loan:						
Balance	1 790	7 033	4 024	5 635	762	
Development cost c/f		1 915	9 574	14 550	21 598	
Cumulative cost	1 790	8 948	13 598	20 185	22 360	
Interest at 7 per cent	125	626	952	1 413	1 565	
New cumulative total	1 915	9 574	14 550	21 598	23 925	
Settler income:						
Production labour at $5						
Oil palm	77	837	581	855	1 184	
Cocoa		318	933	768	573	
Total labour payments	77	1 155	1 514	1 623	1 757	
Net income from rice			180	220	275	
Net income from homestead plot			100	100	200	
Total settler income	77	1 155	1 794	1 943	2 232	

Note (1) Excluding duty and processing, transport and distribution.

TABLE III.6 SMALL-HOLDER FARM TYPE (a) BUDGET ($ THOUSAND)

Year of scheme	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Gross revenue from crops: (fob value)																					
Oil palm (9 acres)	5373	6534	7299	7398	7445	7562	7362	7281	7191	7029	6948	6786	6705	6543	6381	6381	6300	6300	6210	6210	6084
Rubber (6 acres)			1824	2970	3702	4176	4410	4704	4998	5292	5292	→									
Rice (1 acre)	390	390	→																		
Homestead plot (1 acre)	200	300	300	→																	
Total	5963	7224	9813	11058	11835	12228	12462	12675	12879	13011	12930	12768	12687	12525	12363	12363	12282	12282	12192	12192	12066
Less: ex-farm costs																					
Duty - Oil palm	363	449	489	496	498	492	492	487	482	472	465	455	449	437	427	427	421	421	416	416	410
- Rubber			100	164	204	230	243	259	275	292	292	→									
Transport, processing and distribution																					
- Oil palm	1100	1391	1535	1589	1625	1625	1625	1608	1589	1553	1538	1499	1481	1445	1409	1409	1391	1391	1373	1373	1355
- Rubber			364	564	699	782	824	877	929	981	981	→									
Total ex-farm costs	1463	1840	2488	2813	3026	3129	3184	3231	3275	3297	3276	3227	3203	3155	3109	3109	3085	3085	3062	3062	3038
Net farm revenue	4500	5384	7325	8245	8809	9099	9278	9444	9604	9714	9654	9541	9484	9370	9254	9254	9197	9197	9130	9130	9028
On farm production and development costs (1)																					
Oil palm	1250	1207	1209	1203	1202	1202	→						1198	1198	→						
Rubber	292	621	548	400	394	394	394	446	446	→											
Rice	98	98	→																		
Total on farm costs	1640	1926	1855	1701	1694	1694	1694	1746	1746	1746	1746	1746	1742	1742	1742	1742	1742	1742	1742	1742	1742
House amortisation	235	235	→																		
ADU management services charge	200	290	320	320	→																
Replanting fund levy																					
Oil palm														666	666	→					
Rubber														384	384	→					
Net farm income	2425	2933	4915	5989	6560	6850	7029	7143	7303	7413	7353	7240	7187	6023	5907	6142	6085	6085	6018	6018	5916
Repayment of development costs		433	2165	3239	3560	3850	3529	3643	3803	3913	3853	3740	343								
Settler net income	2425	2500	2750	2750	3000	3000	3500	3500	3500	3500	3500	3500	6844	6023	5907	6142	6085	6085	6018	6018	5916
Loan statement:																					
With interest at 7 per cent																					
Debit balance less payment b/d	23250	24445	23991	22431	20441	18022	15755	13215	10337	7148	3795	321									
Add interest at 7 per cent	1628	1711	1679	1570	1431	1262	1103	925	724	500	266	22									
New balance c/f	24878	26156	25670	24001	21872	19284	16858	14140	11061	7648	4061	343									
Alternative with interest at 2 per cent																					
Debit balance less payment b/d	20962	20948	19202	16347	13114	9526	6188	2669													
Add interest at 2 per cent	419	419	384	327	262	191	124	53													
New balance c/f	21381	21367	19586	16674	13376	9717	6312	2722													
Loan payment		433	2165	3239	3560	3850	3529	3643	2722												
Replanting fund levy:																					
Oil palm										513	513	→									
Rubber										282	282	→									
Settler net income	2425	2500	2750	2750	3000	3000	3500	3500	4581	6618	6618	→									

Note (1) 'On farm costs' consists of development costs including labour and production materials only.

TABLE III.7 SMALL-HOLDER FARM TYPE (b) BUDGET ($ THOUSAND)

Year of scheme	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Gross revenue from crops: (fob value)																					
Oil palm (10 acres)	5970	7260	8110	8220	8270	8180	8180	8090	7990	7810	7720	7540	7450	7270	7090	7090	7000	7000	6900	6900	6760
Rubber (5 acres)			1520	2475	3085	3480	3675	3920	4165	4410	4410	→									
Rice (1 acre)	390	390	→																		
Homestead plot (1 acre)	200	300	300	→																	
Total	6560	7950	10320	11385	12045	12350	12545	12700	12845	12910	12820	12640	12550	12370	12190	12190	12100	12100	12000	12000	11860
Less: ex-farm costs																					
Duty - Oil palm	403	499	543	551	553	547	547	541	535	523	517	505	499	486	474	474	468	468	462	462	456
- Rubber			84	137	170	192	203	216	230	243	243	→									
Transport, processing and distribution:																					
- Oil palm	1222	1546	1706	1766	1806	1806	1806	1787	1766	1726	1709	1666	1646	1606	1565	1565	1546	1546	1525	1525	1505
- Rubber			303	474	583	652	687	731	774	818	818	→									
Total ex-farm costs	1625	2045	2636	2928	3112	3197	3243	3275	3305	3310	3287	3232	3206	3153	3100	3100	3075	3075	3048	3048	3022
Net farm revenue	4935	5905	7684	8457	8933	9133	9302	9425	9540	9600	9533	9408	9344	9217	9090	9090	9025	9025	8952	8952	8838
On farm production and development costs (1)																					
Oil palm	1389	1341	1343	1337	1335	1335	1335	1335	1335	1335	1335	1335	1331	1331	→						
Rubber	244	518	457	334	328	328	328	372	372	→											
Rice	98	98	→																		
Total on farm costs	1731	1957	1898	1769	1761	1761	1761	1805	1805	1805	1805	1805	1801	1801	1801	1801	1801	1801	1801	1801	1801
House amortisation	235	235	→																		
ADU management services charge	200	290	320	320	→																
Replanting fund-levy																					
Oil palm													630	630	→						
Rubber													285	285	→						
Net farm income	2769	3423	5231	6133	6617	6837	6986	7065	7180	7240	7173	7048	6073	5946	5819	6054	5989	5989	5916	5916	5802
Repayment of development costs	269	923	2481	3383	3617	3837	3486	3565	3680	3740	3673	2508									
Settler net income	2500	2500	2750	2750	3000	3000	3500	3500	3500	3500	3500	4540	6073	5946	5819	6054	5989	5989	5916	5916	5802
Loan statement																					
Debit balance less payment b/d	23998	24755	24007	22304	20248	17828	15590	12116	10354	7339	4180										
Add interest at 7 per cent	1680	1733	1680	1561	1417	1248	1091	918	725	514	293										
New balance c/f	25678	26488	25687	23865	21665	19076	16681	14034	11079	7853	4473										

Note (1) 'On farm costs' consists of development costs including labour and production materials only.

TABLE III.8 SMALL-HOLDER FARM TYPE (c) BUDGET ($ THOUSAND)

Year of scheme	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Gross revenue from crops: (fob value)																					
Oil palm (11 acres)	6567	7986	8921	9042	9097	8998	8998	8899	8789	8591	8492	8294	8195	7997	7799	7799	7700	7700	7590	7590	7436
Rubber (4 acres)			1216	1980	2468	2784	2904	3136	3332	3528	3528	→									
Rice (1 acre)	390	390	→																		
Homestead plot (1 acre)	200	300	300	→																	
Total	7157	8676	10827	11712	12255	12472	12628	12725	12811	12809	12710	12512	12413	12215	12017	12017	11918	11918	11808	11808	11654
Less: ex-farm costs																					
Duty - Oil palm	443	549	597	606	608	602	602	595	589	575	569	556	549	535	521	521	515	515	508	508	502
- Rubber			67	109	136	153	162	173	184	194	194	→									
Transport, processing and distribution:																					
- Oil palm	1344	1701	1877	1943	1987	1987	1987	1966	1943	1899	1880	1833	1811	1767	1722	1722	1701	1701	1678	1678	1656
- Rubber			242	379	466	522	549	584	619	654	654	→									
Total ex-farm costs	1787	2250	2783	3037	3197	3264	3300	3318	3335	3322	3297	3237	3298	3150	3091	3091	3064	3064	3034	3034	3006
Net farm revenue	5370	6426	8044	8675	9058	9208	9328	9407	9476	9487	9413	9275	9205	9065	8926	8926	8854	8854	8774	8774	8648
On farm production and development costs (1)																					
Oil palm	1528	1475	1477	1471	1469	1469	→						1464	1464	→						
Rubber	195	414	366	267	262	262	298	298	→												
Rice	98	98	→																		
Total on farm costs	1821	1987	1941	1836	1829	1829	1829	1856	1865	1865	→		1860	1860	→						
House amortisation	235	235	→																		
ADU management services charge	200	290	320	320	→																
Replanting fund-levy																					
Oil palm													693	693	→						
Rubber													228	228	→						
Net farm income	3114	3914	5548	6284	6674	6824	6944	6987	7056	7067	6993	6855	5869	5729	5590	5825	5753	5753	5673	5673	5547
Repayment of development costs	614	1414	2798	3534	3674	3824	3444	3487	3556	3567	3493	2372									
Settler net income	2500	2500	2750	2750	3000	3000	3500	3500	3500	3500	3500	4483	5869	5729	5590	5825	5753	5753	5673	5673	5547
Loan statement																					
Debit balance less payment b/d	23559	23794	22662	20714	18490	15960	13633	11100	8321	5336	2217										
Add interest at 7 per cent	1649	1666	1586	1450	1294	1117	954	777	582	374	155										
New balance c/f	25208	25460	24248	22164	19784	17077	14587	11877	8903	5710	2372										

Note (1) 'On farm costs' consists of development costs including labour and production materials only.

TABLE III.9 SMALL-HOLDER FARM TYPE (d) BUDGET ($ THOUSAND)

Year of scheme	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Gross revenue from crops: (fob value)																					
Oil palm (10 acres)	5970	7260	8110	8220	8270	8180	8180	8090	7990	7810	7720	7540	7450	7270	7090	7090	7000	7000	6900	6900	6760
Cocoa (4 acres)	2000	3000	3000	→																	
Rice (1 acre)	390	390	→																		
Homestead plot (1 acre)	200	300	300	→																	
Total	8560	10950	11800	11910	11960	11870	11870	11780	11680	11500	11410	11230	11140	10960	10780	10780	10690	10690	10590	10590	10450
Less: ex-farm costs																					
Duty - Oil palm	403	499	543	551	553	547	547	541	535	523	517	505	499	486	474	474	468	468	462	462	456
Transport, processing and distribution:																					
- Oil palm	1222	1546	1706	1766	1806	1806	1806	1787	1766	1726	1709	1666	1646	1606	1565	1565	1546	1546	1525	1525	1505
- Cocoa	219	328	328	→																	
Total ex-farm costs	1844	2373	2577	2645	2687	2681	2681	2656	2629	2577	2554	2499	2473	2420	2367	2367	2342	2342	2315	2315	2289
Net farm revenue	6816	8577	9223	9265	9273	9189	9189	9124	9051	8923	8856	8731	8667	8540	8413	8413	8348	8348	8275	8275	8161
On farm production and development costs (1)																					
Oil palm	1389	1341	1343	1337	1335	1335	→						1331	1331	→						
Cocoa	565	647	647	647	689	647	647	→					689	647	647	→					
Rice	98	98	→																		
Total on farm costs	2052	2086	2088	2082	2122	2080	2080	→					2118	2076	2076	→					
House amortisation	235	235	→																		
ADU management services charge	200	290	320	320	→																
Replanting fund-levy																					
Oil palm											480	480	→								
Cocoa											176	176	→								
Net farm income	4329	5966	6580	6628	6596	6554	6554	6489	6416	6288	5565	5440	5338	5253	5126	5361	5296	5296	5223	5223	5109
Repayment of development costs	1829	3466	3830	3878	3596	3554	3054	2989	2916	2189											
Settler net income	2500	2500	2750	2750	3000	3000	3500	3500	3500	4099	5565	5440	5338	5253	5126	5361	5296	5296	5223	5223	5109
Loan statement																					
Debit balance less payment b/d	21812	19873	17434	14776	12214	9515	7127	4637	2046												
Add interest at 7 per cent	1527	1391	1220	1034	855	666	499	325	143												
New balance c/f	2339	21264	18654	15810	13069	10181	7626	4962	2189												

Note (1) 'On farm costs' consists of development costs including labour and production materials only.

TABLE III.10 SMALL-HOLDER FARM TYPE (e) BUDGET ($ THOUSAND)

Year of scheme	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Gross revenue from crops: (fob value)																					
Oil palm (9 acres)	5373	6534	7299	7398	7443	7362	7362	7281	7191	7029	6948	6786	6705	6543	6381	6381	6300	6300	6210	6210	6084
Cocoa (5 acres)	2500	3750	3750	→																	
Rice (1 acre)	390	390	→																		
Homestead plot (1 acre)	200	300	300	→																	
Total	8463	10974	11739	11838	11883	11802	11802	11721	11631	11469	11388	11226	11145	10983	10821	10821	10740	10740	10650	10650	10524
Less: ex-farm costs																					
Duty - Oil palm	363	449	489	496	498	492	492	487	482	471	465	455	449	437	427	427	421	421	416	416	410
Transport, processing and distribution:																					
- Oil palm	1100	1391	1535	1589	1625	1625	1625	1608	1589	1553	1538	1499	1481	1445	1409	1409	1391	1391	1373	1373	1355
- Cocoa	274	411	411	→																	
Total ex-farm costs	1737	2251	2435	2496	2534	2528	2528	2506	2482	2435	2414	2365	2341	2293	2247	2247	2223	2223	2200	2200	2176
Net farm revenue	6726	8723	9304	9342	9349	9274	9274	9215	9149	9034	8974	8861	8804	8690	8574	8574	8517	8517	8450	8450	8348
On farm production and development costs (1)																					
Oil palm	1250	1207	1209	1203	1202	1202	→							1198	1198	→					
Cocoa	707	809	809	809	861	809	809	→						861	809	809	→				
Rice	98	98	→																		
Total on farm costs	2055	2114	2116	2110	2161	2109	2109	→						2157	2105	2105	→				
House amortisation	255	235	235	→																	
ADU management services charge	200	290	320	320	→																
Replanting fund-levy																					
Oil palm											432	432	→								
Cocoa											220	220	→								
Net farm income	4236	6084	6633	6677	6633	6610	6610	6551	6485	6370	5658	5545	5488	5326	5262	5497	5440	5440	5373	5373	5271
Repayment of development costs	1736	3584	3883	3927	3633	3610	3110	3051	2985	2183											
Settler net income	2500	2500	2750	2750	3000	3000	3500	3500	3500	4187	5658	5545	5488	5326	5262	5497	5440	5440	5373	5373	5271
Loan statement																					
Debit balance less payment b/d	22189	20158	17686	14997	12414	9673	7240	4696	2040												
Add interest at 7 per cent	1553	1411	1238	1050	869	677	507	329	143												
New balance c/f	23742	21569	18924	16047	13283	10350	7747	5025	2183												

Note (1) 'On farm costs' consists of development costs including labour and production materials only.

TABLE III.11 SMALL-HOLDER FARM TYPE (b) BUDGET ($ THOUSAND)
(ALTERNATIVE WITH RAISED RUBBER PRICE)

Year of scheme	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Gross revenue from crops: (fob value)																					
Oil palm (10 acres)	5970	7260	8110	8220	8270	8180	8180	8090	7990	7810	7720	7540	7450	7270	7090	7090	7000	7000	6900	6900	6760
Rubber (5 acres)			1824	2970	3702	4176	4410	4704	4998	5292	5292	→									
Rice (1 acre)	390	390	→																		
Homestead plot (1 acre)	200	300	300	→																	
Total	6560	7950	10624	11880	12662	13046	13280	13484	13678	13792	13702	13522	13432	13252	13072	13072	12982	12982	12882	12882	12742
Less: ex-farm costs																					
Duty - Oil palm	403	499	543	551	553	547	547	541	535	523	517	505	499	486	474	474	468	468	462	462	456
- Rubber			101	164	204	230	244	259	276	292	292	→									
Transport, processing and distribution:																					
- Oil palm	1222	1546	1706	1766	1806	1806	1806	1787	1766	1726	1709	1666	1646	1606	1565	1565	1546	1546	1525	1525	1505
- Rubber			310	484	596	666	702	747	791	836	836	→									
Total ex-farm costs	1625	2045	2660	2965	3159	3249	3299	3334	3368	3377	3354	3299	3273	3220	3167	3167	3142	3142	3115	3115	3089
Net farm revenue	4935	5905	7964	8915	9503	9797	9981	10150	10310	10415	10348	10223	10159	10032	9905	9905	9840	9840	9767	9767	9653
On farm production and development costs (1)																					
Oil palm	1389	1341	1343	1337	1335	1335	→						1331	1331	→						
Rubber	244	518	457	334	328	328	328	372	372	→											
Rice	98	98	→																		
Total on farm costs	1731	1957	1898	1769	1761	1761	1761	1805	1805	→			1801	1801	→						
House amortisation	235	235	→																		
ADU management services charge	200	290	320	320	→																
Replanting fund-levy																					
Oil palm												550	550	→							
Rubber												255	255	→							
Net farm income	2769	3423	5511	6591	7187	7481	7665	7790	7950	8055	7988	7058	6998	6871	6744	6744	6679	6679	6606	6606	6492
Repayment of development costs	269	923	2761	3841	4187	4481	4165	4290	4450	4555	1348										
Settler net income	2500	2500	2750	2750	3000	3000	3500	3500	3500	3500	6640	7058	6998	6871	6744	6744	6679	6679	6606	6606	6492
Loan statement																					
Debit balance less payment b/d	23998	24755	23727	21547	18868	15708	12643	9238	5435	1260											
Add interest at 7 per cent	1680	1733	1661	1508	1321	1100	885	647	380	88											
New balance c/f	25678	26488	25388	23055	20189	16808	13528	9885	5815	1348											

Note (1) 'On farm costs' consists of development costs including labour and production materials only.

TABLE III.12 JATAN SLDB SUB-SCHEME BUDGET ($ THOUSAND)

Item	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Net revenue from sale of crops				229	1756	2986	3814	4397	4671	4851	4909	4937	4928	4917	1864	4818	4729	4682	4592	4502	4502	4456	4456	4411	4411	4366
Capital costs																										
Land development	600	1113		726			44																			
Management	109	166	139	292																						
Worker housing		907	907																							
Total capital	709	2186	1046	1018			44																			
Operating costs																										
Crop production costs	45	1429	981	1152	1427	1483	1344	1442	1418	1371	1379	1382	1399	1401	1405	1405	1405	1469	1464	1464	→					
Processing, transport and distribution				53	395	675	859	992	1050	1088	1098	1104	1100	1096	1081	1072	1049	1039	1017	996	996	985	985	974	974	974
Management	83	190	309	348	348	→																				
Worker housing maintenance				36	36	→																				
Roads and drains maintenance			48	48	132	132	132	136	136	→																
Replanting fund levy						102	102	102	131	131	→															
Worker transport	5	79	62	77	97	93	76	86	86	80	82	82	83	84	84	→		91	91	→						
Total operating costs	133	1698	1400	1714	2435	2869	2899	3142	3205	3190	3210	3219	3233	3232	3221	3212	3189	3250	3223	3202	3203	3191	3191	3180	3180	3170
Scheme net income	-842	-3884	-2446	-2503	-679	+117	+871	1255	1466	1661	1699	1718	1695	1685	1643	1606	1540	1432	1369	1300	1300	1265	1265	1231	1231	1196

TABLE III.13 IGANG SLDB SUB-SCHEME BUDGET ($ THOUSAND)

Item	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Net revenue from sale of crops				155	1081	1809	2261	2561	2666	2721	2723	2736	2725	2714	2676	2648	2594	2566	2511	2457	2457	2429	2429	2401	2401	2373
Capital costs																										
Land development	339	608		409			22																			
Management	57	70	83	178																						
Worker housing		495	495																							
Total capital	396	1173	578	587			22																			
Operating costs																										
Crop production costs	28	805	510	623	806	831	738	785	767	735	741	742	750	751	753	753	753	789	789	→						
Processing, transport and distribution				33	233	397	502	576	608	629	634	637	634	630	621	616	602	595	582	569	569	563	563	556	556	549
Management	42	137	167	191	191	→																				
Worker housing maintenance				20	20	→																				
Roads and drains maintenance			26	26	71	71	71	73	73	→																
Replanting fund levy						55	55	55	69	69	→															
Worker transport	4	44	30	41	54	52	43	47	46	42	43	43	44	44	→			49	49	→						
Total operating costs	74	986	733	934	1375	1617	1620	1747	1774	1759	1771	1775	1781	1778	1771	1766	1752	1786	1773	1760	1760	1754	1754	1747	1747	1740
Scheme net income	-470	-2159	-1311	-1366	-294	+192	+619	814	892	962	952	961	944	936	905	882	842	780	738	697	697	675	675	654	654	633

TABLE III.14 SAWAI SLDB SUB-SCHEME BUDGET ($ THOUSAND)

Item	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Net revenue from sale of crops				116	906	1543	1964	2299	2461	2581	2629	2653	2660	2667	2652	2631	2585	2563	2519	2475	2475	2452	2452	2430	2430	2408
Capital costs																										
Land development	325	595		363			37																			
Management	61	109	70	144																						
Worker housing		500	500																							
Total capital	386	1204	570	507			37																			
Operating cost																										
Crop production costs	22	775	535	610	642	766	696	778	780	759	767	769	783	786	790	790	790	822	819	819	→					
Processing, transport and distribution				26	195	335	427	508	546	570	579	584	584	585	579	575	563	558	548	537	537	532	532	527	527	521
Management	47	145	170	189	189	→																				
Worker housing maintenance				20	20	→																				
Roads and drains maintenance			25	25	67	67	67	71	71	→																
Replanting fund levy						51	51	51	75	75	→															
Worker transport	3	45	35	41	38	48	41	47	50	47	48	49	50	50	→			54	54	→						
Total operating costs	72	965	765	911	1151	1476	1491	1664	1731	1731	1749	1757	1772	1776	1774	1770	1758	1789	1776	1765	1765	1760	1760	1755	1755	1749
Scheme net income	-458	-2169	-1335	-1302	-245	-67	+436	+635	+730	+850	+880	+896	+888	+891	+878	+861	+827	+774	+743	+710	+710	+692	+692	+675	+675	+659

APPENDIX IV

TABLE IV.1 DETAILS OF PUBLIC SECTOR SCHEMES - PHYSICAL DEVELOPMENT (ACRES)

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
SLDB area settled																									
Oil palm		3245	3245	5863	5863	11182	11182	→																	
Rubber		370	370	1015	1015	1785	1785	→																	
Cocoa				270	270	720	720	→																	
Sub-total SLDB crop areas		3615	3615	7148	7148	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687	13687
Small-holder area settled																									
Oil palm	1890	1890	5835	8390	12425	13086	14880	14880	→																
Rubber	875	875	2290	2290	4820	4820	6190	6190	→																
Cocoa	120	120	995	1505	1505	1505	1665	1665	→																
Rice	195	195	620	950	1250	1250	1430	1430	→																
Homestead plot	195	195	620	950	1268	1268	1536	1536	→																
Sub-total small-holder crop areas	3275	3275	10360	14085	21268	21929	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701	25701
Total area settled																									
Oil palm	1890	5135	9080	14253	18288	24268	26062	26062	→																
Rubber	875	1245	2660	3305	5835	6605	7975	7975	→																
Cocoa	120	120	995	1775	1775	2225	2385	2385	→																
Rice	195	195	620	950	1250	1250	1430	1430	→																
Homestead plot	195	195	620	950	1268	1268	1536	1536	→																
Total crop areas	3275	6890	13975	21233	28416	35616	39388	39388	39388	39388	39388	39388	39388	39388	39388	39388	39388	39388	39288	39388	39388	39388	39388	39388	39388

TABLE IV.2 ECONOMIC ANALYSIS OF PUBLIC SECTOR SCHEMES AT SOCIAL PRICES

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Gross revenue $'000																									
At basic prices			68	175	1125	2907	5810	9813	14053	18735	22373	25479	27386	28751	29502	29834	29959	29924	29807	29527	29254	28910	28630	28376	28154
Rubber price up 20 per cent			68	175	1125	2907	5810	9867	14163	18967	22719	26052	23149	29724	30613	31037	31231	31249	31174	30916	30655	30311	30031	29777	29555
Palm oil and rubber price up 20 per cent			68	193	1273	3341	6673	11298	16181	21635	25885	29531	31763	33414	34313	34714	34870	34836	34704	34379	34059	33654	33324	33026	32766
Farm costs $'000																									
Sarawak Land Development Board Schemes																									
Land development		235	497	248	897	516	1359	193	862	310	278	320	283	283	→										
Materials plus distribution and transport			438	257	701	689	1605	1454	1677	1964	2230	2287	2380	2380	2395	2394	2393	2389	2382	2365	2356	2339	2331	2318	2304
Development labour at $3		62	66	66	86	116	142	10	35	1		1													
Production labour at $3		17	219	164	427	473	860	774	856	913	910	853	881	890	861	875	878	886	910	912	930	930	967	967	967
Total with labour at $3		313	1221	735	2111	1793	3966	2431	3429	3188	3419	3462	3543	3552	3539	3552	3553	3558	3574	3559	3569	3552	3581	3568	3554
Total with labour at $5		365	1411	889	2453	2186	4633	2954	4022	3797	4025	4031	4130	4145	4113	4136	4139	4149	4180	4168	4189	4172	4226	4213	4199
Small-holder Settlement Schemes																									
Land development	204	477	502	1565	1277	1806	1064	1315	604	659	598	474	549	481	481	→									
Materials plus distribution and transport		314	197	903	1131	1963	1904	2636	2891	3250	3398	3684	3691	3804	3810	3823	3844	3841	3842	3827	3817	3793	3778	3765	3757
Development labour at $3	53	67	132	222	239	210	121	100	23	12	5		2												
Production labour at $3	10	201	191	602	800	1325	1298	1404	1975	1657	1655	1730	1787	1849	1931	1749	1975	1994	2013	2043	2065	2093	2097	2110	2110
Total with labour at $3	266	1059	1021	3292	3446	5304	4387	5455	5493	5577	5655	5888	6029	6135	6223	6054	6300	6317	6336	6361	6363	6367	6356	6356	6348
Total with labour at $5	308	1238	1236	3841	4138	6327	5333	6458	6825	6689	6762	7041	7223	7367	7510	7220	7616	7646	7678	7723	7739	7762	7754	7762	7755
Total farm costs at $3	266	1372	2242	4027	5557	7097	8353	7886	8922	8765	9074	9350	9572	9687	9762	9606	9853	9875	9910	9920	9932	9919	9937	9924	9902
Total farm costs at $5	308	1603	2647	4730	6591	8513	9966	9412	10847	10486	10787	11072	11353	11512	11623	11356	11755	11795	11858	11891	11928	11934	11980	11975	11954
Net farm revenue																									
Basic prices labour at $3	-266	-1372	-2174	-3852	-4432	-4190	-2543	1927	5131	9970	13299	16129	17814	19064	19740	20228	20106	20049	19897	19607	19322	18991	18693	18452	18252
Rubber price up lanour at $3	-266	-1372	-2174	-3852	-4432	-4190	-2543	1981	5241	10202	13645	16702	18577	20037	20851	21431	21378	21374	21264	20996	20723	20392	20094	19853	19653
Rubber and palm oil price up labour at $3	-266	-1372	-2174	-3834	-4284	-3756	-1680	3412	7259	12870	16811	20181	22211	23727	24551	25108	25017	24961	24794	24459	24127	23735	23387	23101	22864
Basic prices labour at $5	-308	-1603	2579	-4555	-5466	-5606	-4156	+401	3206	8249	11586	14407	16033	17239	17879	18478	18204	18129	17949	17636	17326	16976	16650	16401	16200

TABLE IV.2 (cont'd)

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Project costs $'000																									
Village development costs																									
SLDB schemes																									
Housing maintenance					20	20	40	40	76	76	→														
Village clearing		186																							
Housing			495	495	500	500	907	907																	
Total development cost		186	495	495	520	520	947	947	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76	76
Small-holder settlement schemes																									
Housing maintenance			16	16	50	76	102	102	123	123	→														
Village clearing	91		206	160	160		128																		
Housing		776		1708	1324	1272		1072																	
Total development cost	91	776	222	1884	1534	1348	130	1174	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123	123
Total development costs	91	962	717	2379	2054	1868	1077	2121	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199	199
Processing costs																									
Oil palm factory fixed					5978	912	912	967	4500	1590	1590	1590	1621	1621	→										
Rubber factory fixed								872	75	150	150	150	567	226	226	→									
Oil palm factory var						77	205	343	526	597	759	891	972	1011	1026	1026	1020	1010	995	997	960	942	927	914	902
Rubber factory var									10	55	99	196	277	329	373	408	436	456	473	481	486	486 →			
Mera-a oil palm processing					11	82	138	175	193	200	204	204	204	202	200	195	193	188	185	181	177	177	175	175	172
Mera-a rubber processing									34	55	69	78	82	88	93	98	98 →								
Credit Kabatu processing										12	103	268	392	465	499	514	521	521	519	513	505	496	487	478	470
Net processing cost					5989	1071	1255	2357	5347	2635	2768	2841	3331	3012	3040	3060	3073	3078	3079	3071	3063	3054	3046	3042	3035
Management costs																									
SLDB area		99	206	358	622	622	948	827	1019	727	727	→													
SLDB cost to small-holder	94	230	400	859	831	1330	890	924	291	280	185														
SLDB transport cost		4	44	33	86	94	172	143	172	184	182	171	176	178	173	176	176	177	183	183	187	187	194	194	194
ADU costs					49	78	194	340	492	556	639	679	675	675 →											
Total management costs	94	333	650	1250	1588	2124	2204	2234	1974	1747	1733	1577	1576	1580	1575	1578	1578	1579	1585	1585	1589	1589	1596	1596	1596
Total project costs																									
Village development	91	962	717	2379	2054	1868	1077	2121	199	199	→														
Processing					5989	1071	1255	2357	5347	2635	2768	2841	3331	3012	3040	3060	3073	3078	3079	3071	3063	3054	3046	3042	3035
Management	94	333	650	1250	1588	2124	2204	2234	1974	1747	1733	1577	1578	1580	1575	1578	1578	1579	1585	1585	1589	1589	1596	1596	1596
Credit forest revenue	356	441	772	767	780	1389	2629																		
Net project cost	+171	-854	-595	-2842	-8851	-3674	-1907	-6712	-7520	-4581	-4700	-4617	-5108	-4791	-4814	-4837	-4850	-4856	-4863	-4855	-4851	-4842	-4841	-4837	-4830
Net cash flow																									
Basic price labour at $3	-95	-2226	-2769	-6694	-13282	-7864	-4450	-4785	-2389	+5389	+8599	+11512	+12706	+14273	14926	15391	15256	15193	15034	14752	14471	14149	13852	13615	13422
Rubber price up 20% labour at $3	-95	-2226	-2769	-6644	-13283	-7864	-4450	-4731	-2279	+5621	+8945	+12065	+13469	+15246	16037	16594	16528	16518	16401	16141	15872	15550	15253	15016	14823
Oil palm and rubber price up labour at $3	-95	-2226	-2769	-6676	-13135	-7430	-3587	-3300	-261	+8289	+12111	+15564	+17103	+18936	19737	20271	20167	20105	19931	19604	19276	18893	18546	18264	18034
Basic prices labour at $5	-137	-2457	-3174	-7397	-14317	-9280	-6063	-6311	-4314	+3668	+6886	+9790	+10925	+12448	13065	13641	13354	13273	13086	12781	12475	12134	11809	11564	11370

TABLE IV.3 ECONOMIC ANALYSIS OF PUBLIC SECTOR SCHEMES AT MARKET PRICES

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Gross sales revenue $'000																									
At basic prices			68	168	1067	2741	5482	9250	13232	17643	21045	23967	25763	27049	27758	28073	28194	28165	28058	27799	27546	27225	26965	26728	26521
Rubber price up 20 per cent			68	168	1067	2741	5482	9301	13335	17862	21372	24509	26484	27968	28808	29210	29396	29417	29351	29112	28871	28550	28289	28052	27845
Palm oil and rubber price up 20 per cent								10621	15195	20325	24292	27717	29835	31370	32220	32601	32752	32725	32606	32305	32009	31632	31326	31048	30806
Farm costs $'000																									
Total excluding small-holder labour	565	1293	3393	3439	5788	5563	8054	6361	7611	7665	7905	8264	8306	8430	8404	8440	8464	8471	8503	8486	8487	8446	8485	8459	8437
Small-holder family income		252	292	895	1309	2119	2367	3091	3115	3426	3495	3629	3629	→											
Net farm revenue $'000																									
At basic price	-565	-1545	-3617	-4166	-6030	-4941	-4939	-202	+2506	6550	9645	12074	13828	14990	15725	16004	16101	16065	15926	15684	15430	15150	14851	14640	14455
Rubber price up 20 per cent	-565	-1545	-3617	-4166	-6030	-4941	-4939	-151	+2609	6769	9972	12616	14549	15909	16775	17141	17303	17317	17219	16997	16755	16475	16175	15964	15779
Palm oil and rubber price up 20 per cent	-565	-1545	-3617	-4150	-5893	-4541	-4141	+1169	+4469	9232	12892	15824	17900	19311	20187	20532	20659	20625	20474	20190	19893	19557	19212	18960	18740
Total project costs																									
Village development	91	962	717	2379	2054	1868	1077	2121	199	199	→														
Processing					5989	1071	1255	2357	5347	2635	2768	2841	3331	3012	3040	3060	3073	3078	3079	3071	3063	3054	3046	3042	3035
Management cost	94	333	650	1250	1588	2124	2204	2234	1974	1747	1733	1577	1578	1580	1575	1578	1578	1579	1585	1585	1589	1589	1596	1596	1496
Credit forest revenue	356	441	772	787	780	1389	2629																		
Net project cost	+171	-854	-595	-2842	-8851	-3674	-1907	-6712	-7520	-4581	-4700	-4617	-5108	-4791	-4841	-4837	-4850	-4856	-4863	-4855	-4851	-4842	-4841	-4837	-4830
Export duties																									
Export duties at basic prices				8	65	188	376	644	921	1252	1512	1735	1874	1977	2033	2057	2066	2063	2054	2032	2011	1985	1963	1944	1927
Export duties at raised prices (20 per cnet)				9	77	226	452	773	1105	1503	1814	2082	2249	2372	2439	2469	2480	2476	2465	2439	2414	2382	2356	2333	2312
Net cash flow																									
Excluding duty	-394	-2399	-4212	-7008	-14881	-8615	-6846	-6914	-5014	+1969	4945	7457	8720	10199	10911	11167	11251	11209	11063	10829	10579	10308	10010	9803	9625
Ditto with raised prices	-394	-2399	-4212	-6992	-14744	-8215	-6048	-5543	-3051	+4651	8192	11207	12792	14520	15373	15695	15809	15769	15611	15335	15042	14715	14371	14123	13910
Including duty	-394	-2399	-4212	-6999	-14804	-8389	-6394	-6141	-3909	+3472	6759	9539	10969	12571	13350	13636	13731	13685	13528	13268	12993	12690	12366	12136	11937
Ditto with raised prices	-394	-2399	-4212	-6983	-14667	-7989	-4496	-4770	-1946	+6154	9996	13289	15041	16892	17812	18164	18289	18245	18076	17774	17456	17097	16727	16456	16222

TABLE IV.4 PUBLIC SECTOR SETTLEMENT SCHEMES FOREIGN EXCHANGE FLOWS ($ THOUSAND)

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Gross revenue $'000																									
At basic prices			48	157	1060	2844	5705	9729	13938	18665	22304	25447	27345	28717	29469	29798	29918	29878	29754	29466	29187	28835	28550	28291	28064
Rubber price up 20 per cent			48	157	1060	2844	5705	9783	14047	18896	22650	26020	28109	19690	30580	31001	31190	31202	31121	30855	30588	30236	29951	29692	29465
Palm oil and rubber price up 20 per cent			48	157	1212	3286	6587	11241	16105	21618	25880	29569	31815	33453	34354	34753	34903	34862	34722	34388	34060	33646	33310	33006	32741
Farm costs $'000																									
Farm and development costs	88	251	600	980	1376	1766	2290	2351	2539	2528	2645	2591	2628	2587	2601	2603	2614	2613	2615	2609	2601	2596	2594	2592	2590
Net farm revenue $'000																									
At basic prices	-88	-251	-552	-822	-316	1077	3415	7378	11399	16136	19659	22856	24717	26130	26868	27196	27305	27265	27139	26858	26586	26239	25956	25699	25474
Rubber price up 20 per cent	-88	-251	-552	-822	-316	1077	3415	7432	11508	16368	20005	23429	25481	27103	27979	28398	28577	28589	28506	28247	27987	27640	27357	27100	26875
Palm oil and rubber price up 20 per cent	-88	-251	-552	-805	-164	1520	4297	8890	13566	19089	23236	26978	29187	30867	31753	32150	32289	32248	32107	31779	31459	31050	30716	30415	30151
Project costs $'000																									
Village clearing	18	37	41	32	32		26																		
Oil palm factory					1904	492	535	597	1966	1018	1020	1007	975	928	932	932	930	928	924	914	910	906	906	902	898
Rubber factory								53	4	8	8	9	35	15	15	15	16	16	17	17					
Mera-a oil palm pricessing				5	33	55	70	77	80	82	82	82	81	80	78	77	75	74	73	71	71	70	70	69	69
Mera-a rubber processing								1	1	2	2														
Management	9	33	61	122	150	203	203	209	180	156	137	141	140	140											
SLDB transport			1	6	11	21	28	30	34	35	32	33	34	32	33	33	33	33	34	34					
Total project costs	28	70	102	165	2130	771	862	967	2265	1301	1281	1274	1267	1197	1200	1199	1196	1193	1190	1178	1174	1169	1169	1164	1160
Credit forest revenue (+)	356	441	772	787	780	1389	2629																		
Net project costs	+328	+371	+670	+622	-1350	+618	+1767	-967	-2265	-1301	-1281	-1274	-1267	-1197	-1200	-1199	-1196	-1193	-1190	-1178	-1184	-1169	-1169	-1164	-1160
Net cash flow																									
At basic price	+240	+120	+118	-200	-1666	+1695	+5182	+6411	+9134	+14835	+18378	+21582	+23450	+24933	+25668	+25997	+26109	+26072	+25949	+25680	+25412	+25070	+24787	+24535	+24314
Rubber price up 20 per cent	+240	+120	+118	-200	-1666	+1695	+5182	+6465	+9243	+15067	+18724	+22155	+24214	+25906	+26779	+27199	+27381	+27396	+27316	+27069	+26813	+26471	+26188	+25936	+25715
Palm oil and rubber price up 20 per cent	+240	+120	+118	-183	-1514	+2138	+6064	+7923	+11301	+17768	+21955	+25704	+27920	+29670	+30553	+30951	+31093	+31055	+30917	+30601	+30285	+29881	+29547	+29251	+28991

TABLE IV.5 ECONOMIC ANALYSIS OF ROAD BASED IMPROVEMENT SCHEMES AT MARKET PRICES ($ THOUSAND)

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Gross sales revenue (excluding duty)																									
Palm oil				29.2	253.6	688.9	1276.2	1938.1	2660.1	3495.2	4457.6	5120.0	5489.6	5640.8	5688.9	5681.9	5628.0	5561.5	5469.4	5372.9	5276.7	5276.7	→	→	→
Palm kernels				3.3	34.1	98.3	194.3	300.5	412.5	541.3	688.7	792.1	849.4	873.0	880.4	879.3	871.0	860.8	846.6	831.6	816.8	816.8	→	→	→
Cocoa					40.3	181.4	448.0	800.8	1189.4	1580.3	2000.3	2287.0	2448.3	2448.3	→	→	→	→	→	→	→	→	→	→	→
Rubber								246.8	1163.5	2687.9	4634.4	6818.3	9110.1	11643.4	13313.0	14523.2	15355.9	15930.4	16381.5	16670.8	16845.0	16845.0	→	→	→
Rice			37.4	143.9	295.4	479.3	686.0	896.3	1133.0	1214.7	1277.8	1310.5	1310.5	→	→	→	→	→	→	→	→	→	→	→	→
Other crops			23.0	90.0	198.0	360.5	563.0	808.5	1085.0	1263.5	1458.7	1542.5	1542.5	→	→	→	→	→	→	→	→	→	→	→	→
Total revenue			60.4	266.4	821.4	1808.4	3167.5	4991.0	7643.5	10782.9	14517.5	17870.4	20750.4	23458.5	25183.6	26385.7	27156.2	27654.0	27998.8	28176.6	28239.8	28239.8	28239.8	28239.8	28239.8
Farm costs														→	→	→	→	→	→	→	→	→	→	→	→
Land development(1)	15.9	140.1	348.8	485.5	541.0	570.2	595.3	615.1	276.7	139.7	139.7														
Production materials(1)		176.7	492.0	821.3	1183.1	1628.7	2116.1	2805.9	2939.9	3351.3	3781.4	4117.3	4364.9	4648.2	4675.2	4771.3	4839.0	4896.8	4951.1	4959.3	4960.9	4950.6	4939.3	4931.1	4931.1
Farmers subsistence income	75.0	292.5	637.5	1096.3	1658.8	2300.8	3004.5	3467.5	3819.3	4063.5	4195.5	4195.5		→	→	→	→	→	→	→	→	→	→	→	→
Total farm costs	90.9	609.3	1478.3	2403.1	3382.9	4499.7	5715.9	6888.5	7035.9	7554.5	8116.6	8452.5	8700.1	8983.4	9010.4	9106.5	9174.2	9232.0	9286.3	9294.5	9296.1	9285.8	9274.5	9266.3	9266.3
Net farm revenue	-90.9	-609.3	-1417.9	-2136.7	-2561.5	-2691.3	-2548.4	-1897.5	+607.6	+3228.4	+6400.9	+9417.9	+12050.3	+14475.1	+16173.2	+17279.2	+17982.0	+18422.0	+18712.5	+18882.1	+18943.7	+18954.0	+18965.3	+18973.5	+18973.5
Project costs:																									
Processing costs																									
Oil palm				4.1	37.4	103.8	195.8	302.0	423.3	565.3	728.7	837.0	897.4	922.2	930.1	928.9	920.1	909.2	894.1	878.4	862.7	850.3	838.8	827.4	816.6
Rubber								33.3	157.1	362.9	625.7	920.5	1229.9	1571.9	1797.3	1960.7	2073.1	2160.7	2211.6	2250.6	2274.2	2274.2	→	→	→
Cocoa					2.8	12.7	31.4	56.1	83.3	110.6	140.0	160.1	171.4	171.4	→	→	→	→	→	→	→	→	→	→	→
Sub-total processing costs				4.1	40.2	116.5	227.2	391.4	663.7	1038.8	1494.4	1917.6	2298.7	2665.5	2898.8	3061.0	3164.6	3231.3	3277.1	3300.4	3308.3	3295.9	3284.4	3273.0	3262.2
ADU management costs:																									
Management	562.5	1307.6	1236.1	1502.8	1453.3	1446.6	1790.3	1170.2	1162.4	1173.7	1198.2	1294.9	1304.8	1253.7	1283.2	1247.7	1291.0	1175.4	1165.2	1173.0	1227.8	1200.0	1200.0	→	→
Headquarter costs	365.9	86.6	86.6	→	→	→	119.0	86.6	86.6	→	→	→	119.0	86.6	86.6	→	→	→	119.0	86.6	86.6	→	→	→	→
Training	154.0	100.0	100.0	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Sub-total ADU costs	1082.4	1494.2	1422.7	1689.4	1639.2	1633.2	2009.3	1356.8	1249.0	1260.3	1294.8	1381.5	1423.8	1340.3	1369.8	1334.3	1377.6	1262.0	1284.2	1259.6	1314.4	1286.6	1286.6	→	→
Total project costs	1082.4	1494.2	1422.7	1693.5	1680.1	1749.7	2236.5	1748.2	1912.7	2299.1	2779.2	3299.1	3722.5	4005.8	4268.6	4395.3	4542.2	4493.3	4561.3	4560.0	4622.7	4582.5	4571.0	4559.6	4548.8
Net cash flow	-1173.3	-2103.5	-2840.6	-3830.2	-4241.6	-4441.0	-4784.9	-3645.7	-1305.1	+929.3	+3621.7	+6118.8	+8327.8	+10469.3	+11904.6	+12883.9	+13439.8	+13926.7	+14151.2	+14322.1	+14321.0	+14371.5	+14394.3	+14431.9	+14424.7

Note (1) 'Land development and production materials excluding labour.

TABLE IV.6 ECONOMIC ANALYSIS OF ROAD BASED IMPROVEMENT SCHEMES - AT SOCIAL PRICES ($ THOUSAND)

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Gross revenue (fob prices)																									
Palm oil				31.7	274.7	746.1	1380.7	2099.2	2885.9	3787.2	4834.1	5552.5	5953.3	6117.3	6169.4	6161.8	6103.3	6031.3	5931.4	5826.7	5722.4	5722.4	→	→	→
Palm kernels				3.3	34.1	98.3	194.3	300.5	412.5	541.3	688.7	792.1	849.4	873.0	880.4	879.3	871.0	860.8	846.6	831.6	816.8	816.8	→	→	→
Rubber								261.3	1232.0	2846.0	4907.0	7219.4	9645.9	12328.3	14096.1	15377.5	16259.2	16867.5	17345.1	17651.5	17835.9	17835.9	→	→	→
Cocoa					40.3	181.4	448.0	800.8	1189.4	1580.3	2000.3	2287.0	2448.3	2448.3	→	→	→	→	→	→	→	→	→	→	→
Rice			37.4	143.9	295.4	479.3	686.0	896.3	1133.0	1214.7	1277.8	1310.5	1310.5	→	→	→	→	→	→	→	→	→	→	→	→
Other crops			23.0	90.0	198.0	360.5	563.0	808.5	1085.0	1263.5	1458.7	1542.5	1542.5	→	→	→	→	→	→	→	→	→	→	→	→
Total revenue			60.4	268.9	842.5	1865.6	3272.0	5166.6	7937.8	11233.0	15166.6	18704.0	21749.9	24619.9	26447.2	27719.9	28534.8	29060.9	29424.4	29611.1	29676.4	29676.4	29676.4	29676.4	29676.4
Farm costs																									
Land development(1)	15.9	140.1	348.8	485.5	541.0	570.2	595.3	615.1	276.7	139.7	139.7	→	→	→	→	→	→	→	→	→	→	→	→	→	→
Production materials(1)		176.7	492.0	821.3	1183.1	1628.7	2116.1	2805.9	2939.9	3351.3	3781.4	4117.3	4364.9	4648.2	4675.2	4771.3	4839.0	4896.8	4951.1	4959.3	4960.9	4939.3	4931.1	4931.1	4931.1
Farmer labour(2)	49.5	193.1	420.8	723.6	1094.8	1518.5	1983.0	2288.6	2520.7	2681.9	2769.0	2769.0	→	→	→	→	→	→	→	→	→	→	→	→	→
Total farm costs	65.4	509.9	1261.6	2030.4	2818.9	3717.4	4694.4	5709.6	5737.3	6172.9	6690.1	7026.0	7273.6	7556.9	7583.9	7680.0	7747.7	7805.5	7859.8	7868.0	7869.6	7859.3	7848.0	7839.8	7839.8
Net farm revenue	-65.4	-509.9	-1201.2	-1761.5	-1976.4	-1851.8	-1422.4	-543.0	+2200.5	+5060.1	+8476.5	+11678.0	+14476.3	+17063.0	+18863.3	+20039.9	+20787.1	+21255.4	+21564.6	+21743.1	+21806.8	+21817.1	+21828.4	+21836.6	+21836.6
Project costs																									
Processing costs				4.1	40.2	116.5	227.2	391.4	663.7	1038.8	1494.4	1917.6	2298.7	2665.5	2898.8	3061.0	3164.6	3231.3	3277.1	3300.4	3308.3	3295.9	3284.4	3273.0	3262.2
ADU costs	1082.4	1494.2	1422.7	1693.5	1680.1	1749.7	2236.5	1748.2	1912.7	2299.1	2779.1	2779.2	3299.1	3722.5	4005.8	4395.3	4542.2	4493.3	4561.3	4560.0	4622.7	4582.5	4571.0	4559.6	4548.8
Total project costs	1082.4	1494.2	1422.7	1697.6	1720.3	1866.2	2463.7	2139.6	2576.4	3337.9	4273.6	5216.7	6021.2	6671.3	7167.4	7456.3	7706.8	7724.6	7838.4	7860.4	7931.0	7878.4	7855.4	7832.6	7811.0
Net cash flow	-1147.8	-2004.1	-2623.9	-3459.1	-3696.7	-3718.0	-3886.1	-2682.6	-375.9	+1722.2	+4202.9	+6461.3	+8455.1	+10391.7	+11695.9	+12583.6	+13080.3	+13530.8	+13530.8	+13726.2	+13882.7	+13875.8	+13973.0	+14004.0	+14025.6

Notes (1) 'Land development' and 'production material' costs excluding labour

(2) Opportunity cost of farmers family labour assessed at net value of subsistence production replaced, $330 increasing over five years to $1 000 per family per annum.

TABLE IV.7 FINANCIAL ANALYSIS OF ROAD BASED IMPROVEMENT SCHEMES ($ THOUSAND)

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Gross sales revenue																									
Market prices (excluding duty)			60.4	266.4	821.4	18.8.4	3167.5	4991.0	7643.5	10782.9	14517.5	17870.4	20750.4	23458.5	25183.6	26385.7	27156.2	27654.0	27998.8	28176.6	28239.8	28239.8	→		
Farm costs (excluding labour)	15.9	316.8	840.8	1306.8	1724.1	2198.9	2711.4	3421.0	3216.6	3491.0	3921.1	4257.0	4504.6	4787.9	4814.9	4911.0	4978.7	5036.5	5090.8	5099.0	5100.6	5090.3	5079.0	5079.8	5079.8
Farmers subsistence income	75.0	292.5	637.5	1096.3	1658.8	2300.8	3004.5	3467.5	3819.3	4063.5	4195.5	4195.5	→												
Processing costs				4.1	40.2	116.5	227.2	391.4	663.7	1038.8	1494.4	1917.6	2298.7	2665.5	2898.8	3061.0	3164.6	3231.3	3277.1	3300.4	3308.2	3295.9	3284.4	3273.0	3262.2
Total costs	90.9	609.3	1478.3	2407.2	3423.1	4616.2	5943.1	7279.9	7699.6	8593.3	9611.0	10370.1	10998.8	11648.9	11909.2	12167.5	12338.8	12463.3	12563.4	12594.9	12604.3	12581.7	12558.9	12539.3	12528.5
Net cash flow (NCF)	-90.9	-609.3	-1417.9	-2140.8	-2601.7	-2807.8	-2775.6	-2288.9	-56.1	+2189.6	+4906.5	+7500.3	+9751.6	+11809.6	+13274.4	+14218.2	+14817.4	+15190.7	+15435.4	+15581.7	+15635.5	+15658.1	+15680.9	+15700.5	+15711.3
Repayment capacity																									
Cumulative balance	-90.9	-706.6	-2174.0	-4467.0	-7381.4	-10705.9	-14230.9	-17516.0	-18798.2	-17924.5	-14272.7	-7771.5	+1436.1	+13346.2	+27554.8	+43701.8	+61578.3	+81079.5	+102190.5	+124925.5	+149305.8	+175415.3	+203375.3	+233312.1	+265355.2
Interest at 7 per cent	6.4	49.5	152.2	312.7	516.7	749.4	996.2	1226.1	1315.9	1254.7	999.1	544.0	100.5	934.2	1928.8	3059.1	4310.5	5675.6	7153.3	8744.8	10451.4	12279.1	14236.3	16331.8	18574.9
New balance	-97.3	-756.1	-2326.2	-4779.7	-7898.1	-11455.3	-15227.1	-18742.1	-20114.1	-19179.2	-15271.8	-8315.5	+1536.6	+14280.4	+29483.6	+46760.9	+65888.8	+86755.1	+109343.8	+133670.3	+159757.2	+187694.4	+217611.6	+249643.9	+283930.1

TABLE IV.8 PRODUCTION GENERATED BY PRIVATE INVESTOR DEVELOPMENT

Year	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
CROP PRODUCTION (Tons)												
Palm oil		136	1 295	4 463	10 215	16 995	23 209	28 568	31 956	33 894	34 774	35 040
Palm kernels		20	222	810	1 951	3 338	4 634	5 710	6 387	6 779	6 955	7 008
Rubber						109	426	1 050	2 354	4 084	6 112	8 141
Cocoa			27	119	324	783	1 479	2 368	3 226	3 789	4 046	4 051
Rice	54	186	429	665	859	1 060	1 136	1 189	1 212	1 215	1 216	1 216
CATTLE (Heads)												
Cull cows and bulls	28	88	102	225	406	471	623	716	801	922	946	975
Beef steers and heifers		100	296	270	1 148	1 568	1 844	3 426	3 276	4 142	4 222	4 216
Total cattle	28	188	398	495	1 554	2 039	2 467	4 142	4 077	5 064	5 168	5 191

TABLE IV.8 (cont'd)

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
CROP PRODUCTION (Tons)											
Palm oil	34 964	34 639	34 188	33 650	33 077	32 456	32 456	→	→	→	→
Palm kernels	6 993	6 928	6 836	6 730	6 615	6 491	6 491	→	→	→	→
Rubber	9 463	10 381	11 065	11 605	12 016	12 286	12 286	→	→	→	→
Cocoa	4 051	4 051	→	→	→	→	→	→	→	→	→
Rice	1 216	1 216	→	→	→	→	→	→	→	→	→
CATTLE (Heads)											
Cull cows and bulls	1 149	1 149	→	→	→	→	→	→	→	→	→
Beef steers and heifers	4 302	4 302	→	→	→	→	→	→	→	→	→
Total cattle	5 451	5 451	5 451	5 451	5 451	5 451	5 451	5 451	5 451	5 451	5 451

TABLE IV.9 PRIVATE INVESTORS DEVELOPMENT ECONOMIC ANALYSIS AT SOCIAL PRICES ($ THOUSAND)

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Gross revenue (fob prices)																									
Palm oil				60	558	1888	4260	6951	9330	11370	12718	13490	13840	13946	13916	13786	13604	13393	13165	12918	12918	→			
Palm kernels				7	69	246	583	981	1339	1622	1814	1925	1975	1990	1986	1968	1941	1911	1879	1843	1843	→			
Rubber								120	468	1153	2585	4484	6711	8939	10390	11398	12149	12742	13194	13490	13490	→			
Cocoa					30	133	363	877	1657	2652	3613	4244	4531	4537	4537	→									
Rice			17	59	136	211	272	336	360	377	384	385	386	386	→										
Beef - Menatan				11	78	166	178	528	516	700	720	724	824	824	→										
- Karabungan						28	191	407	435	1294	1265	1716	1764	1774	2018	2018	→								
Total revenue			17	137	871	2672	5847	10200	14105	19168	23099	26968	30031	32396	34057	34927	35459	35811	36003	36016	36016	36016	36016	36016	36016
Crop costs																									
Land development	306	903	1512	2452	3171	3284	2488	1678	1279	1096	1007	1007	987	859	857	857	→								
Crop production	51	739	997	1704	2734	3186	4009	4426	4932	5485	6012	6378	6656	6822	6843	6902	6939	6978	7003	6993	6983	6959	6942	6926	6903
Labour at $3	54	300	806	1283	1913	2470	2949	3044	2920	2801	2845	3041	3345	3651	3852	3963	4036	4099	4159	4215	4254	4273	4291	4292	4294
Total farm costs	411	1942	3315	5439	7818	8940	9446	9148	9131	9382	9864	10426	10989	11332	11552	11723	11832	11934	12019	12065	12094	12089	12090	12075	12054
Net farm revenue	-411	-1942	-3298	-5302	-6947	-6268	-3599	+1052	+4974	+9786	+13235	+16542	+19042	+21064	+22505	+23204	+23627	+23877	+23984	+23951	+23922	+23927	+23926	+23941	+23962
Estate costs																									
Housing		486	1072	1799	2118	1759	1162	242	243	164	164	→													
Management	605	837	1112	1562	2284	2816	2676	2748	2636	2329	292	394	353	299	291	291	470	299	327	292	299	299	394	311	370
Processing				8	77	268	613	1035	1452	1861	2247	2606	2942	3242	3423	3532	3600	3568	3667	3667	→				
Credit forest revenue	296	972	1526	2850	2593	2405	2030	30	→																
Net project costs	309	351	658	519	1887	2438	2621	3995	4331	4354	2703	3164	3459	3705	3878	3987	4234	4031	4158	4123	4130	4130	4225	4142	4301
Net cash flow	-720	-2293	-3956	-5821	-8834	-8706	-6220	-2943	+643	+5432	+10532	+13378	+15583	+17359	+18627	+19217	+19393	+19846	+19826	+19828	+19792	+19797	+19701	+19799	+19661

TABLE IV.10 MEDIUM SCALE (600 ACRES) PRIVATE INVESTOR CASH FLOW ($ THOUSAND)

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Production																										
Rubber (400 acres)								112	180	224	252	268	284	304	320	320	→									
Cocoa (200 acres)					44.6	89.2	134	134	→																	
Revenue (fob)																										
Rubber (up 20 per cent)								148	237	295	332	353	374	400	421	421	→									
Cocoa					50	100	150	150	→																	
Total					50	100	150	298	387	445	482	503	524	550	571	571	571	571	571	571	571	571	571	571	571	571
Export duty																										
Rubber								8	13	16	18	20	21	22	23	23	→									
Net sales revenue					50	100	150	290	374	429	464	483	503	528	548	548	548	548	548	548	548	548	548	548	548	548
Total development costs	23	147	4	30	8	8	8	31	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
Crop production costs																										
Materials		47	31	33	34	40	43	59	49	51	49	49	52	52	→			54	52	52	→					
Labour at $5 per man day		82	83	65	50	44	44	78	107	111	118	119	125	126	128	128	→									
Total crop production cost		129	114	98	84	84	87	137	156	162	167	168	177	178	180	180	180	182	180	180	180	180	180	180	180	180
Crop processing, transport and distribution costs																										
Rubber								24	38	47	52	55	58	62	65	65	→									
Cocoa					5	11	16	16	→																	
Total					5	11	16	40	54	63	68	71	74	78	81	81	81	81	81	81	81	81	81	81	81	81
Management																										
Capital	15	51	3																							
Recurrent	13	34	34	→																						
Total management	28	85	37	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34	34
Housing																										
Capital		79	79																							
Maintenance					3	3	→																			
Total		79	79	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Overall total costs	51	440	234	165	134	140	171	225	258	273	283	287	299	304	309	309	309	311	309	309	309	309	309	309	309	309
Net cash flow	-51	-440	-234	-165	-84	-40	-21	+65	+116	+156	+181	+196	+204	+224	+239	+239	+239	+239	+239	+239	+239	+239	+239	+239	+239	+239

TABLE IV.11 PRIVATE INVESTORS FINANCIAL ANALYSIS AT MARKET PRICES ($ THOUSAND)

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Revenue (Gross sales revenue)																									
Palm oil				55	515	1745	3933	6407	8611	10485	11727	12439	12762	12860	12832	12713	12545	12350	12139	11911	11911	→			
Palm kernels				6	69	246	583	981	1339	1622	1814	1925	1975	1990	1986	1968	1941	1911	1879	1843	1843	→			
Rubber								113	442	1089	2441	4235	6338	8442	9813	10765	11474	12034	12461	12741	12741	→			
Cocoa					30	133	363	877	1657	2652	3613	4244	4532	4537	4537	→									
Rice			17	59	136	211	272	336	360	377	384	385	386	386	→										
Beef - Menantan				11	76	166	178	528	516	700	720	724	824	824	→										
- Karabungan						27	191	407	435	1294	1265	1716	1764	1774	2018	2018	→								
Total revenue			17	131	828	2528	5520	9649	13360	18219	21965	25668	28581	30813	32396	33211	33725	34060	34244	34260	34260	34260	34260	34260	34260
Crop costs																									
Land development	306	903	1512	2452	3171	3284	2488	1678	1279	1096	1007	1007	987	859	857	857	→								
Crop production	52	739	997	1704	2734	3186	4009	4426	4932	5485	6012	6378	6656	6822	6843	6902	6939	6979	7003	6993	6983	6959	6942	6926	6903
Labour at $5	89	499	1344	2139	3189	4166	4914	5073	4867	4668	4742	5068	5577	6086	6420	6606	6726	6839	6931	7025	7089	7121	7151	7154	7156
Total farm costs	447	2141	3853	6295	9094	10586	11411	11177	11078	11249	11761	12453	13220	13767	14120	14365	14522	14666	14791	14875	14929	14937	14950	14937	14916
Net farm revenue	-447	-2141	-3836	-6164	-8266	-8058	-5891	-1528	+2282	+6970	10204	13215	15361	17046	18276	18846	19203	19394	19453	19385	19331	19323	19310	19323	19344
Total estate costs (excluding credit forest revenue)	605	1323	2184	3369	4480	4842	4651	4025	4332	4354	2703	3164	3460	3705	3878	3987	4234	4031	4158	4123	4131	4131	4226	4142	4301
Net cash flow	-1052	-3464	-6020	-9533	-12746	-12900	-10542	-5553	-2050	+2616	+7501	10051	11901	13341	14398	14859	14969	15363	15295	15262	15200	15192	15084	15181	15043
Repayment capacity																									
Cumulative balance	-1052	-4590	-10931	-21228	-35460	-50841	-64942	-75040	-82345	-85494	-83978	-79805	-73491	-65295	-55467	-44492	-32637	-19559	-5633	+9235					
Interest at 7 per cent	74	321	765	1486	2482	3559	4546	5253	5764	5985	5878	5586	5144	4571	3883	3114	2285	1369	394	646					
New balance	-1126	-4911	-11696	-22714	-37942	-54400	-69488	-80293	-88109	-91479	-89856	-85391	-78635	-69866	-59350	-47606	-34922	-20928	-6027	+9881					

TABLE IV.12 OVERALL ECONOMIC ANALYSIS OF AGRICULTURAL SECTOR SCHEMES INITIATED UNDER THE ACTION PROGRAMME AT SOCIAL PRICES
($ THOUSAND)

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Gross revenue (basic prices) (fob)																									
SLDB and small holding public sector			68	168	1067	2741	5482	9250	13232	17643	21045	23967	25763	27049	27758	28073	28194	28165	28058	27799	27546	27225	26965	26728	26521
Road based improvement scheme				60	269	843	1866	3272	5167	7938	11233	15167	18704	21750	24620	26447	27720	28535	29061	29424	29611	29676	29676	→	
Private investors scheme					17	137	871	2672	5847	10200	14105	19168	23099	26968	30031	32395	34057	34926	35460	35811	36002	36016	36016	→	
NLC beef ranch			22	156	333	355	1386	1610	1961	2000	1949	2152	2152	→											
Beef breeding and training project			7	12	57	76	185	186	345	422	486	495	518	612	649	688	688	→							
Total fob gross revenue			97	396	1743	4152	9790	16990	26552	38203	48818	60949	70236	78531	85210	89755	92811	94466	95419	95874	95999	95757	95497	95260	95053
Farm costs																									
Land development																									
SLDB and small holding public sector	204	712	999	1813	2174	2322	2423	1508	1466	969	876	794	832	764	764	→									
Road based improvement scheme		16	140	349	486	541	570	595	615	277	140	140	→												
Private investors scheme			306	903	1512	2452	3171	3284	2488	1678	1279	1096	1007	1007	987	859	857	857	→						
NLC beef ranch	357	631	615	30	30	→																			
Beef breeding and training project		273	235	421	222	17	17	18	19	19	→		20	20	→										
Sub-total - Land development	561	1632	2295	3516	4424	5362	6211	5435	4618	2973	2344	2079	2029	1961	1941	1813	1811	1811	1811	1811	1811	1811	1811	1811	1811
Production																									
SLDB and small holding public sector		314	635	1160	1832	2652	3509	4090	4568	5214	5628	5971	6071	6184	6205	6217	6237	6230	6224	6202	6173	6132	6109	6083	6061
Road based improvement scheme			177	492	821	1183	1629	2116	2806	2940	3351	3761	4117	4265	4648	4675	4771	4839	4897	4951	4959	4961	4951	4939	4931
Private investors scheme			52	739	997	1704	2734	3186	4009	4426	4932	5485	6012	6376	6656	6822	6843	6902	6939	6979	7003	6993	6983	6959	6942
NLC beef ranch	103	2562	1491	969	244	288	293	298	300	300	300	305	305	→											
Beef breeding and training project		230	262	1330	399	166	203	205	207	209	210	211	212	213	213	214	214	→							
Sub total - Production	103	3126	2617	4710	4233	5993	8368	9895	11690	13089	14421	15753	16717	17445	18027	18233	18370	18490	18579	18651	18654	18605	18562	18500	18453
Labour at $3/Subsistence income farmers																									
SLDB and small holding public sector	63	347	608	1054	1552	2124	2421	2288	2889	2563	2570	2584	2670	2739	2792	2624	2853	2880	2923	2955	2955	3023	3064	3077	3077
Road based improvement scheme		77	420	977	1496	1944	2334	2703	2929	2610	2764	3077	3423	3806	4275	4544	4649	4752	4817	4877	4904	4926	4937	4949	4965
Private investors scheme			54	300	806	1283	1913	2470	2949	3044	2920	2801	2845	3041	3346	3651	3852	3964	4036	4098	4159	4215	4254	4273	4291
NLC beef ranch	2	4	4	→																					
Beef breeding and training project		13	25	50	63	63	→																		
Sub-total - Labour at $3/ Subsistence income farmers	65	441	1111	2385	3921	5418	6735	7528	8834	8304	8321	8529	9005	9653	10480	10886	11421	11663	11843	11997	12125	12231	12322	12366	12400
Total farm costs	729	5199	6023	10611	12578	16773	21314	22858	25342	24366	25086	26361	27751	29059	30448	30932	31602	31964	32233	32459	32590	32647	32695	32677	32664
Net farm revenue	-729	-5199	-5926	-10215	-10835	-12621	-11524	-5868	+1210	+13837	+23732	+34588	+42485	+49472	+54762	+58823	+61209	+62502	+63186	+63415	+63409	+63110	+62802	+62583	+62389

TABLE IV.12 (cont'd)

Year	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Project costs																									
Housing settlers/workers																									
SLDB and small holding public sector	91	962	717	2379	2054	1868	1077	2121	199	199	→														
Road based improvement scheme																									
Private investors scheme				486	1072	1799	2118	1759	1162	242	244	164	164	→											
Sub-total - Housing	91	962	717	2865	3126	3667	3195	3880	1361	441	443	363	363	363	363	363	363	363	363	363	363	363	363	363	363
Management and workers transport																									
SLDB and small holding public sector	94	333	650	1250	1588	2124	2204	2234	1874	1747	1733	1577	1578	1580	1575	1578	1578	1579	1585	1585	1589	1589	1596	1596	1596
Road based improvement scheme		928	1394	1323	1589	1540	1533	1909	1257	1249	1261	1285	1382	1424	1340	1370	1334	1378	1262	1284	1260	1314	1287	1287	1287
Private investors scheme			605	837	1113	1562	2284	2816	2876	2748	2636	2329	292	394	353	299	292	292	470	299	327	292	299	299	394
NLC beef ranch	348	359	284	222	186	186	202	181	285	186	181	241	217	186	181	181	285	186	202	181	186	186	241	192	285
Beef breeding and training project		491	308	450	528	245	258	203	207	207	208	341	212	214	214	214	274	214	214	→					
Sub-total - Management	442	2111	3241	4082	5004	5657	6481	7343	6599	6137	6019	5773	3681	3798	3663	3642	3763	3649	3733	3563	3576	3595	3637	3588	3776
Processing																									
SLDB and small holding public sector					5989	1071	1255	2357	5347	2635	2768	2841	3331	3012	3040	3060	3073	3078	3079	3071	3063	3054	3046	3042	3035
Road based improvement scheme					4	40	117	227	391	664	1039	1494	1918	2299	2666	2899	3061	3165	3231	3277	3300	3308	3296	3284	3273
Private investors scheme						8	78	269	613	1035	1452	1861	2247	2606	2942	3242	3423	3532	3600	3568	3667	3667	→		
Sub-total - Processing					5993	1119	1450	2853	6351	4334	5259	6196	7496	7917	8648	9201	9557	9775	9910	9916	10030	10029	10009	9993	9975
Training																									
ADU Training Centre		154	100	100	→																				
Bintulu Agricultural Centre	744	222	114	114	→																				
Sub-total - Training	744	376	214	214	→					114	114	→													
Total project costs	1277	3449	4172	7161	14337	10697	11340	14290	14525	11026	11835	12446	11654	12192	12788	13320	13797	13901	14120	13956	14083	14101	14123	14058	14228
Credit forest revenue																									
SLDB and small holding public sector	356	441	772	787	780	1389	2629	→																	
Private investors scheme			296	972	1526	2850	2593	2405	2030	30	→														
Total credit forest revenue	356	441	1068	1759	2306	4239	5222	2405	2030	30	→														
Net project costs	921	3008	3104	5402	12031	6418	6118	11885	12495	10996	11835	12446	11654	12192	12788	13320	13797	13901	14120	13956	14083	14101	14123	14058	14228
Net cash flow including forestry	-1650	-8207	-9030	-15617	-22866	-19039	-17642	-17753	-11285	+2841	+11897	+22142	+30831	+37280	+41974	+45503	+47412	+48601	+49066	+49459	+49326	+49009	+48679	+48525	+48161
Net cash flow excluding forestry	-2006	-8648	-10098	-17376	-25172	-23278	-22864	-20158	-13315	+2811	+11897	+22142	+30831	+37280	+41974	+45503	+47412	+48601	+49066	+49459	+49326	+49009	+48679	+48525	+48161

APPENDIX V

APPENDIX V

APPLICATION OF LAND RENT TO SMALL-HOLDER FARMERS

V.1 INTRODUCTION

To supplement the farm budgets section of this Report and the discussion of land rents in Supporting Report No. 9 an analysis of possible land rents applicable to small-holder settlement schemes is detailed here.

The main purpose of this exercise has been to assess rent levels in relation to various financial objectives; no attempt has been made to simulate actual financial arrangements between the small-holders and Government. At the national economy or Government level the objectives has been to show what levels of rent would be required to ensure adequate returns to development capital. At the farmer level achievement of an income capable of supporting adequate living standards has been the objective.

V.2 DETERMINATION OF POSSIBLE RENT LEVELS

For this analysis a series of financial flows for the whole small-holder development included in the Action Programme were computed at various assumed rental levels and the returns to the development calculated by discounting the net cash flows.

In all, four flows were worked out on the following basis of revenues and costs:-

Revenues: that the main revenue item would be the return from rent charged on land; three levels with first payments made after six or eight years were assumed. Other income would be derived from fees received for processing crops in the central processing facilities and from export duty in those situations in which duty has been included in the analysis.

Costs: that the main costs would be the initial development costs of the crop including land clearing, roads, drainage, housing and the like. Other costs included in the analysis were construction and operation of the processing facilities; management and provision of a guaranteed minimum income of up to $2 500 per annum to settlers during the scheme development period.

For each 'cash flow' over 25 years a supportable rate of interest was derived for each level of rent as shown in Table V.1. From this data a series of graphs relating rent to sup-

TABLE V.1 PROJECT RETURNS RELATED TO RENTAL RATES AND DATE OF FIRST PAYMENT

Rental payable		Supportable rates of interest	
		Including duty	Excluding duty
Dollars per acre		Per cent	
First rent payable in year 6:	150	6.79	3.92
	200	8.37	5.80
	250	9.82	7.48
First rent payable in year 8:	175	6.57	3.84
	225	7.80	5.33
	275	8.92	6.56

portable interest rate were drawn as shown in Figures V.1 and V.2.

From the graphs it is possible to derive annual rental rates for the two starting dates to secure a given interest rate. The interest rate which is regarded as the minimum required by Government for financial viability is seven per cent, and at this rate the following rentals would be charged:-

	Rental per acre	
	Including duty	Excluding duty
	$	$
Starting payment in year 6	156	236
Starting payment in year 8	191	293

V.3 RENT IMPLICATIONS AT THE FARM LEVEL

The next stage in the analysis was to test the rentals derived above in the small-holder budgets calculated in Chapter 12. Farm types 'a' and 'd' were selected for this purpose. A preliminary examination showed that it would not be practical for the small-holder to commence rent payments in year six and hence the rates starting in year eight were used. The budgets derived on this basis are summarised in Table V.2. The following comments are relevant to the analysis:-

(a) in the analysis based on farm type 'a' it is shown that the situation in which the farmer pays duty and a lower rent produces the most acceptable income stream;

(b) in the case of farm type 'd' the rental payment excluding duty could not be met in later years while that including duty was satisfactory;

(c) both analyses show that crop yield levels influence income to a great extent and this factor would have to be taken into account in setting any rental level. Two possibilities appear practical; firstly, that a 'fixed'

FIGURE V. 1

SMALLHOLDER RENT LEVELS ASSUMING FIRST RENT COLLECTED IN YEAR 6 FROM INITIAL DEVELOPMENT

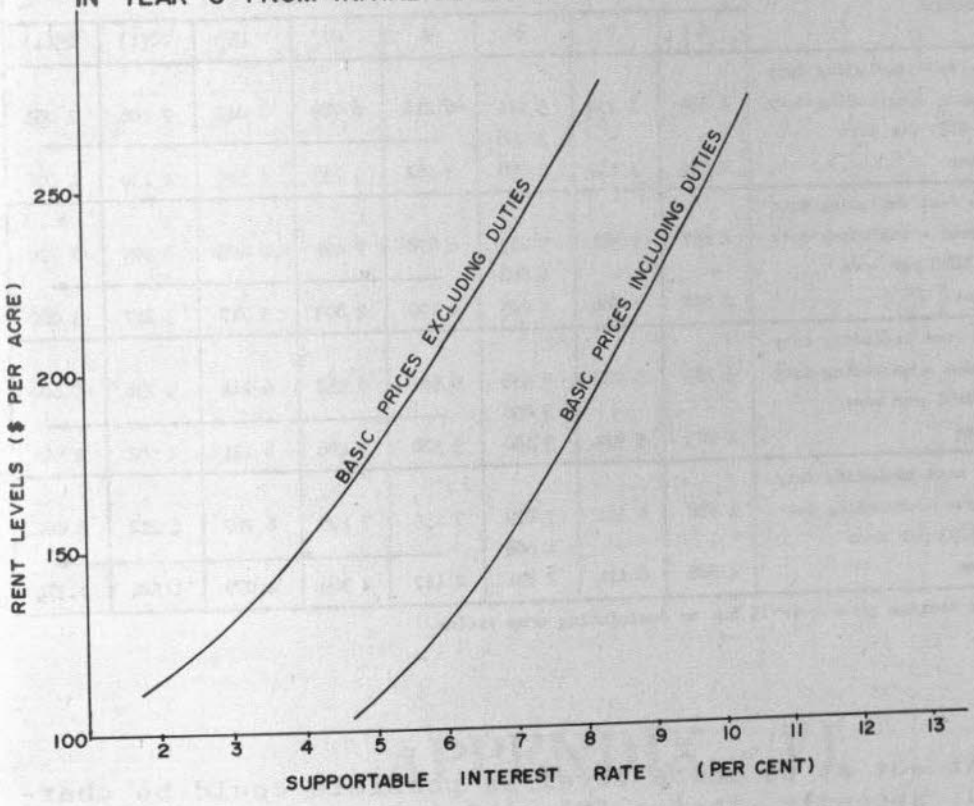


FIGURE V. 2

SMALLHOLDER RENT LEVELS ASSUMING FIRST RENT COLLECTED IN YEAR 8 FROM INITIAL DEVELOPMENT

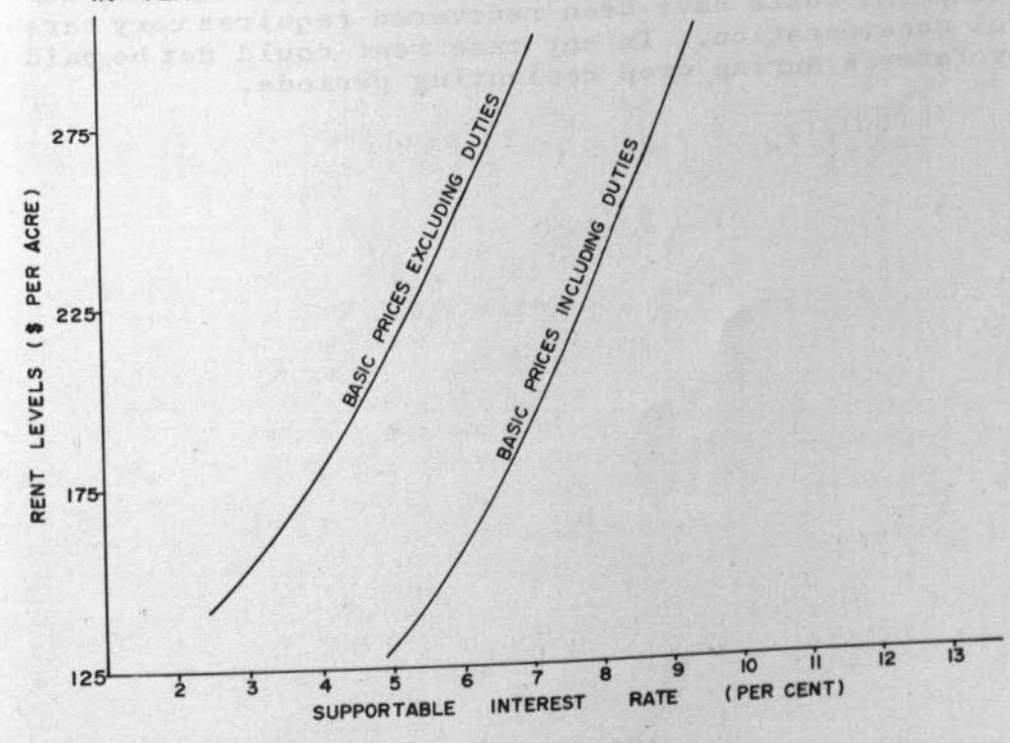


TABLE V.2 SMALL-HOLDER FARM BUDGETS ALLOWING FOR LAND RENT PAYMENTS

Detail	Years (from clearing)							
	6	7	8	9	10	15	20(1)	25(1)
Farm type (a) - rent including duty								
Net farm revenue - excluding duty	2 534	3 132	5 144	6 218	6 789	7 642	7 186	7 062
Land rent at $191 per acre	-	-	3 056	→	→	→	→	→
Net farm income	2 534	3 132	2 088	3 162	3 733	4 586	4 130	4 006
Farm type (a) - rent excluding duty								
Net farm revenue - including duty	2 897	3 581	5 733	6 878	7 491	8 405	7 905	7 770
Land rent at $293 per acre	-	-	4 688	→	→	→	→	→
Net farm income	2 897	3 581	1 045	2 190	2 803	3 717	3 217	3 082
Farm type (d) - rent including duty								
Net farm revenue - including duty	4 285	5 922	6 536	6 584	6 552	6 244	5 738	5 600
Land rent at $191 per acre	-	-	3 056	→	→	→	→	→
Net farm income	4 285	5 922	3 480	3 528	3 496	3 121	2 682	2 544
Farm type (d) - rent excluding duty								
Net farm revenue - excluding duty	4 688	6 421	7 079	7 135	7 105	6 767	6 212	6 062
Land rent at $293 per acre	-	-	4 688	→	→	→	→	→
Net farm income	4 688	6 421	2 391	2 447	2 369	2 079	1 524	1 374

Note (1) Incomes decline after year 15 due to diminishing crop yields.

rent set at as low a level as possible could be charged; secondly, that a 'flexible' rent related to potential net income of a 'standard' farmer could be charged;

(d) the rental rates required to recover development would be relatively high and the desirability of continuing with payments at the same level after the initial development costs have been recovered requires very careful consideration. In any case rent could not be paid by farmers during crop replanting periods.

APPENDIX VI

APPENDIX VI

FARM SURVEY OF THE STUDY AREA

VI.1 INTRODUCTION AND SUMMARY

The object of this survey was to collect information on farms in the Study Area, and particularly the following:-

- the resources available at farm level;
- patterns of resource disposition and utilisation;
- the patterns of disposal of agricultural produce.

As there were obvious difficulties in collecting reliable, quantitative information about all crop production inputs and outputs it was necessary to confine the study to a simple range of basic data which was collected from a sufficiently large sample of farms to provide a meaningful picture for the Study Area.

Agriculture in the Study Area generally follows the typical shifting pattern of cultivation found in Sarawak with rubber and pepper as the main crops grown on a settled basis. A typical holding in the survey area would have the following pattern of activities:-

Activity	Average size	Range in size
	acres	
Crops:		
Padi - wet	2.7	1.5 to 4.5
hill	4.4	2.5 to 6.5
Rubber	9.0	1.0 to 10.0
Pepper	0.3	0.15 to 0.35
Annual crops	1.1	0.5 to 1.1
Perennial crops	0.6	0.1 to 3.0
Total crop areas	18.1	
Livestock:		
Poultry	20 birds	5 to 25 birds
Pigs	5 head	2 to 9 heads

The standards of rubber and pepper husbandry and performance observed were generally low and few farmers used fertilisers, insecticides and other modern inputs to full advantage. The availability of inputs was restricted by poor and expensive transport and the poor range of products carried by dealers. Higher outputs were achieved from rice cultivation than elsewhere in Sarawak probably due to the longer cultivation cycle, averaging about five years, and the availability of primary or secondary forest for clearing.

Although labour was relatively plentiful at the farm level, averaging about three adult worker equivalents per family, much time appeared to be wasted walking to distant parcels of land and between scattered plots planted to different crops. Exchange of labour was frequently organised to cope with major farming operations and provided a means of overcoming seasonal peaks in farming operations.

A significant number of people left their farms during the year to seek wage employment. This did not appear to interfere with farming operations as they are organised at present, but this would not necessarily apply if improvement programmes were undertaken in future.

A number of subsidiary activities particularly livestock and a variety of annual and perennial crops contributed to diversification of the farm economy and provided subsistence food requirements for the family. The scope for increasing these activities would appear limited by transportation and marketing problems.

The sale and disposal of crops and livestock were apparently restricted to many areas by transport difficulties and the generally poor communications with commercial centres. Most farmers in 'ulu' areas were dependant on hawkers or traders to collect goods from their kampongs or longhouses. This dependance tended to restrict their freedom of choice in respect of trading and credit transactions. Nevertheless credit ties did not appear to be strong and farmers could generally buy or sell where they wanted to. Many farmers tended to store produce in the expectation of getting better prices.

VI.2 SAMPLING METHOD

The Study Area was delineated into nine survey areas closely following the regional planning units defined by the Regional Planner and the population census circles as shown in Figure VI.1, to differentiate between areas with distinct land use patterns indicated by the 1968 Land Use Survey. A sample of 102 farmers was selected using a two stage sampling method with stratification taking account of land use patterns to achieve coverage of possible major variations in the survey area. Farmers were randomly selected from 50 kampongs or longhouses (two from each) which had been selected with probability of selection in proportion to the number of kampongs in the survey areas.

The interview method of data collection was adopted. Survey enumerators were accompanied by agricultural assistants or junior agricultural assistants during all their visits to the kampongs and their assistance greatly facilitated the whole operation. Two questionnaires were used. The first, concerning general background information on the kampong selected was for the headmen to answer. The two randomly selected farmers answered the more detailed questionnaire on farming activities. The first questionnaire usually took half an hour to complete while the second required one-and-a-half to three hours per farmer.

VI.2.1 Ethnic Groups

Of the kampongs selected, 49 per cent were Ibans, 19 per cent Kedayans, 12 per cent Malays, six per cent Punans, six per cent Kenyahs or Kayans, four per cent Chinese, one per cent Kiput and one per cent Berawan. Details are given in Table VI.1.

TABLE VI.1 CLASSIFICATION OF SURVEYED KAMPONGS BY ETHNIC GROUPING

Study Area	Race								
	Iban	Kedayan	Malay	Punan	Kayan/ Kenyah	Chinese	Kiput	Berawans	Total
1		2	1						3
2	3		1						4
3	1	8							9
4	5		1	2					8
5	2		1			2	1		6
6	4				3			1	8
7, 8, 9	10		2	1					13
Overall	25	10	6	3	3	2	1	1	51
Per cent	49	19.5	11.6	5.9	5.9	5.9	2	2	100

The majority of Iban farmers were from areas 2, 4 and 7. Kedayan farmers were exclusively found in areas 1 and 3. Malay farmers were found in all other survey areas except 3 and 6. The most varied ethnic composition was in areas 5 and 6 where Kayan or Kenyah, Kiput and Berawan races were interviewed. If muslim farmers are treated as one class, they make up about 37 per cent of sampled farmers. The above description corresponds quite well with the overall picture of the Study Area with the exception of Chinese who are under-represented in the sample. A study of the Chinese communities in Riam area however was made by the sociologists (Sociology Field Report No. 2).

VI.3 MIGRATION

All farmers were found to be migrants to the Study Area, 43 per cent from within the Fourth Division and most of the others, largely Ibans, were from the Second and Third Divisions accounting for 28 per cent and 20 per cent of migrants respectively. Four per cent originated from Brunei and were mostly Kedayans who settled along the coast between Lutong and the Sibuti area. Four per cent were Chinese from the mainland of China.

VI.4 SETTLEMENT

Most people (75 per cent) claimed to have stayed in the area they occupy at present since before the Japanese occupation. During this period houses have been rebuilt four or five times or new houses built in new areas. The average number of doors per longhouse/kampong was 31. Area 5 had a particularly high

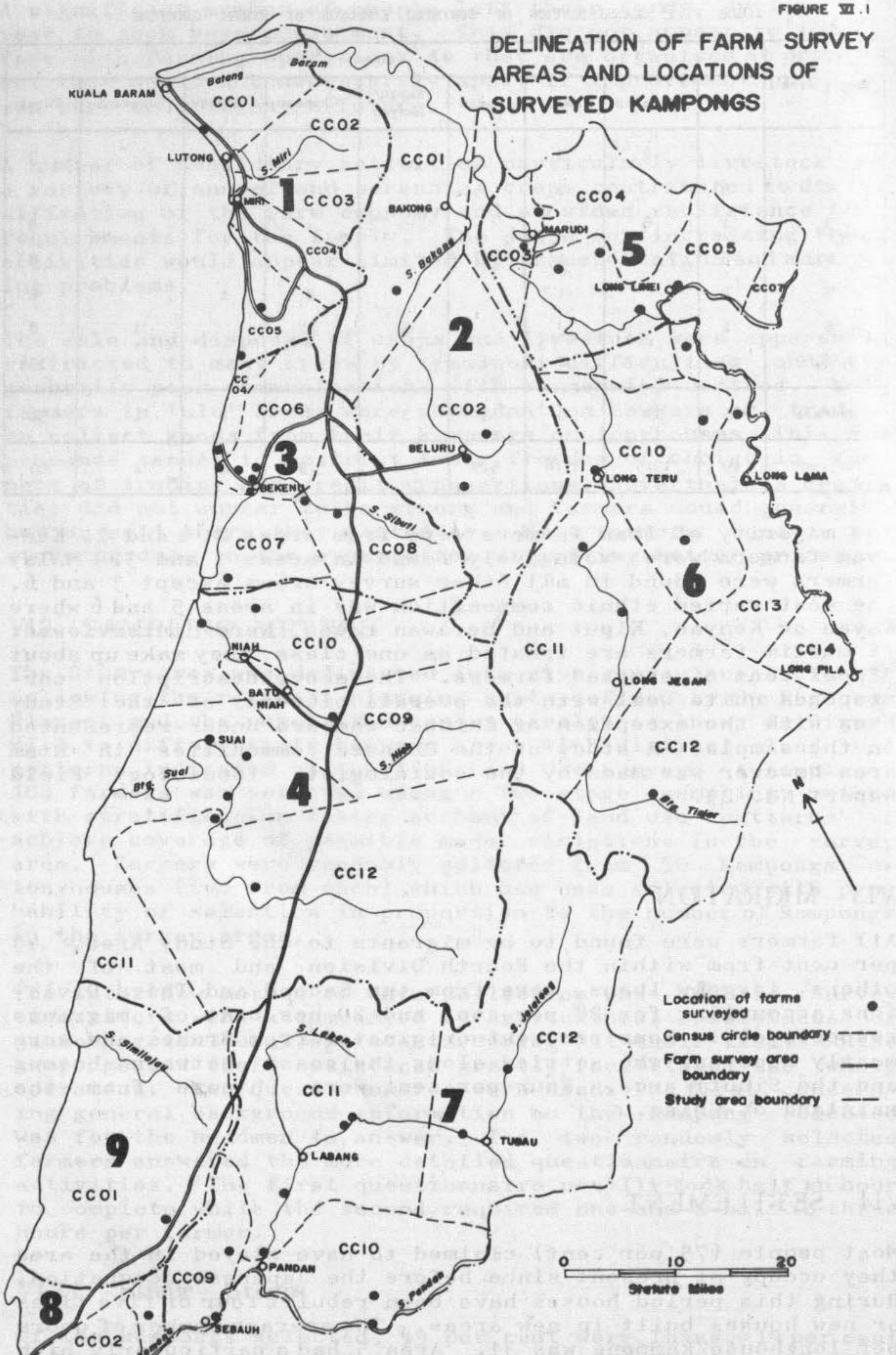


FIGURE VI.1

DELINEATION OF FARM SURVEY AREAS AND LOCATIONS OF SURVEYED KAMPONGS

TABLE VI.2 SETTLEMENT PATTERNS IN THE SURVEY AREAS

Survey Area	Years since first settlement	Age of present dwelling years	Average number bileks in kampong/ longhouse/settlement	Average number of times house rebuilt
1	69 (3)	30 (2)	26 (3)	3 (3)
2	33 (4)	11 (4)	30 (4)	5 (4)
3	50 (9)	20 (9)	32 (9)	3 (7)
4	45 (7)	5 (7)	30 (8)	2 (8)
5	66 (6)	25 (6)	40 (6)	3 (6)
6	48 (8)	16 (8)	25 (8)	4 (8)
7, 8, 9	45 (13)	12 (10)	31 (13)	6 (11)
Overall average	50	16	31	4

Note: Figures in brackets indicate number of reports on which data is based.

average figure. This can be attributed to large Chinese settlement in Marudi area. Details are given in Table VI.2.

VI5 WORK FORCE AND EMPLOYMENT

VI.5.1 Potential and Available Work Force

The average number of persons per bilek or household was 6.5. Based on assumptions given in Table VI.3, the average potential household work force was 4.3 adult units. If the actual available time each member of the family contributed to farm work is taken into account the available work force is reduced to 3.2 adult equivalents. This figure takes into account schooling and off-farm work, but not berjalai (a period between the padi planting season and the commencement of the harvesting season during which young men go out hunting and travelling). This may account for a further 0.5 worker units leaving an available work force of 2.7 adult equivalents per family. If the mother of the family has to spend all her

TABLE VI.3 AVERAGE FAMILY SIZE AND WORK FORCE

Survey Area	Average number persons per bilek or household	Average adult unit equivalent in family work force (1)		Families reporting hired labour	Exchange of labour
		Potential available in family	Actual available on farm		Average man days exchanged per family
1	7.2 (6)	5.1	3.1 (6)	16.7	
2	8.0 (8)	5.1	3.9 (8)	Nil	114 (3)
3	6.0 (18)	3.6	2.7 (18)	22.2	48 (6)
4	7 (16)	4.4	3.1 (16)	18.8	68 (7)
5	6.5 (12)	4.7	3.6 (12)	33.3	17 (7)
6	7.2 (16)	4.5	3.1 (16)	12.5	131 (8)
7, 8, 9	5.6 (26)	4.0	3.1 (26)	3.8	28 (22)
Overall	6.5 (102)	4.3	3.2 (102)	14	55 (53)

Notes: (1) Assume 60 years of age = 0.66 unit
15 to 60 years of age = 1 unit
7 to 14 years of age = 0.5 unit
less than 7 years of age = 0 unit

Figures in brackets indicate number of reports on which data is based.

available time looking after children, then the available work force might only be 1.7 adult units per family.

VI.5.2 Off-farm Employment

Members of families seeking employment outside their farms mostly engaged in timber work and agriculture (working on other farms). Quite a substantial number was also engaged in commerce as shop assistants, labourers, drivers, Government services and road construction. Relatively few were engaged in building, mining or as 'workers'. On the average, about 0.4 persons per bilek was away on off-farm employment. Only 10 per cent of farmers visited claimed to be part time farmers. Details are given in Table VI.4.

TABLE VI.4 OFF-FARM EMPLOYMENT (NUMBER PERSONS)

Survey Area	Number kampongs reporting	Agriculture including SLDB	Forestry	Building	Road construction	Government	Mining etc	Ship yards	Commerce	Others	Total
1	3	23	-	-	2	2	4	5	4	11	51
2	4	4	21	4	10	-	-	-	-	-	39
3	9	47	23	1	1	13	-	1	22	1	109
4	8	-	47	-	7	6	-	-	10	2	72
7, 8, 9	13	13	30	7	2	10	5	-	-	27	94
Total	37	87	121	12	22	31	9	6	36	41	365
Average number persons/kampong		2.3	3.3	0.3	0.6	0.8	0.2	0.1	0.9	1.1	9.86
Average number persons/bilek		0.1	0.1	0.01	0.02	0.03	Negligible	Negligible	0.03	0.03	0.36
Percentage in sector		23.8	33.2	3.3	6.0	8.5	2.5	1.6	9.9	11.2	100

VI.5.3 Age Distribution of the Household

The age structure of the average household is given in Table VI.5. On this basis 54 per cent of the average family were

TABLE VI.5 AGE STRUCTURE OF AVERAGE HOUSEHOLD

Age class	Average no. of persons		Total	Percentage
	Male	Female		
0 - 7	0.77	0.78	1.5	24
8 - 14	0.64	0.48	1.1	17
15 - 60	1.82	1.71	3.5	54
60+	0.17	0.17	0.3	5
Total	3.40	3.14	6.4	100

in the 15 to 60 year age group. Seventeen per cent were in the 8 to 14 year age group and 24 per cent to the 0 to 7 year age group. The remaining five per cent consisted of those over 60 years of age. Details are given in Table VI.5.

VI.5.4 Exchange of Labour

Most bilek reported that there was communal labour organisation for construction of roads, bridges and other projects for the benefit of the community as a whole (usually involving people from one longhouse). Exchange of labour among farmers also took place for major farming operations like clearing of land, planting and harvesting, but the extent of this activity was not easily assessed. The range measured in terms of man days, was as low as 17 to as high as 114 man days per family per annum, the average was 55 man days (Table VI.3). Few farmers were able to afford to hire labour, only 14 per cent of farmers did in 1972.

VI.6 LAND AVAILABILITY AND LAND USE

VI.6.1 Cultivation Patterns and Cycles

Sixty-eight per cent of respondents claimed to have virgin or secondary forest land available for clearing and on average the area available was sufficient for eight more years of clearing (Table VI.6). This data is of a highly subjective nature but there is good comparison of availability between different survey areas.

Areas 1, 2 and 5 reported little new forest land for clearing and short shifting cultivation cycles.

VI.6.2 Temuda Cycles

The average cycle of cultivation on temuda land calculated from three to eight years between survey areas. An indication of the relative scarcity of new forest land is given by the statistic that 83 per cent of land cleared for hill padi was temuda.

Temuda cycles reported by headmen are more varied than those by farmers though the average for both sets of data turned out to be around five and six years. The number of temuda parcels per farm was 4.4.

VI.6.3 Fragmentation of Cropped Land

Fragmentation of the cropped area results in farmers having parcels of land which are often some distance apart. Most

TABLE VI.6 AVAILABILITY OF FOREST LAND AND TEMUDA CYCLE

Survey area	Forest land number of kampongs		Average no. of years to complete clearing	Temuda cycle average years
	Reporting forest available	Per cent		
1	1	33	NA (0)	3 (3)
2	1	25	1 (1)	3.3 (3)
3	7	78	3.6 (5)	8 (9)
4	5	62	3.3 (4)	5.2 (6)
5	2	33	7.0 (2)	4 (3)
6	6	75	5.6 (5)	6.1 (8)
7, 8, 9	13	100	12.5 (13)	3.9 (13)
Overall total	35	68.6	7.8 (30)	5.1 (45)

Notes: Figures in brackets indicate number of reports on which data is based.
NA = Not available.

pepper gardens were within 30 minutes walking distance from farm or longhouses and for rubber some 60 per cent were within 30 minutes walking distance, but for hill padi, more than 66 per cent, and wet padi about 50 per cent, were more than 30 minutes walk away. Details are given in Table VI.7.

TABLE VI.7 FRAGMENTATION OF LAND

Survey Area	Average number parcels cropped land	Average number parcels Temuda land	Crop	Distance to plots planted to crops					
				Nearest plots		Further plots		Total number plots reported	
				Per cent					
				30 min	30 min	30 min	30 min	30 min	30 min
1	6	3.5	Hill padi	100	-	33	66	21	36
2	5.3	5.6							
3	5.2	3.9	Wet padi	95	5	40	60	39	19
4	6.4	4.3							
5	3.4	2.2	Rubber	98	2	58	42	68	16
6	5.5	4.0							
7, 8, 9	3.6	5.5	Pepper	93	7	57	43	47	6
Total/ Average	4.9	4.4							

VI.7 CROP AND LIVESTOCK ACTIVITIES

The main crops grown in the Study Area are padi, rubber and pepper. Ninety-three per cent of the farmers visited planted padi in 1972, 91 per cent had rubber and 67 per cent pepper (Table VI.8). There are few coconuts in the survey area and only 15 per cent of the farmers reported having them. Annuals which include maize, tapioca and 'native' vegetables, mostly interplanted with padi, were planted by some 70 per

TABLE VI.8 CROP ACREAGES AND LIVESTOCK NUMBERS

Survey Area	Rubber					Padi			Pepper			Coconut	Fish pond	Annuals	Perennials	Total	Pigs average number	Per cent housed	Poultry average number	Per cent housed
	Non-RPS		RPS		Total	Hill	Wet	Total	Immature	Mature	Total									
	Immature	Mature	Immature	Mature																
1	-	7.5 (4)	3.0 (2)	-	7.2 (5)	2.3 (2)	2.2 (6)	3.0 (6)	0.13 (1)	0.09 (1)	0.22 (1)	0.93 (3)	0.01 (1)	0.42 (6)	0.95 (6)	10.84 (6)	-		16.2 (6)	Nil
2	4.4 (2)	6.9 (6)	-	5.0 (1)	7.9 (7)	4.3 (5)	4.4 (6)	6.7 (6)	0.21 (5)	0.43 (2)	0.32 (6)	2.50 (2)	-	0.98 (6)	0.91 (6)	24.14 (8)	3.7 (4)	50	26.4 (8)	25
3	1.3 (2)	35.5 (2)	3.4 (4)	2.0 (4)	6.3 (15)	3.0 (8)	1.8 (17)	3.1 (18)	0.20 (7)	0.26 (8)	0.25 (14)	0.38 (6)	-	0.53 (10)	0.30 (16)	9.23 (18)	2.5 (2)	50	22.2 (17)	12
4	1.9 (3)	7.5 (11)	4.5 (6)	6.0 (1)	8.1 (15)	5.3 (16)	3.4 (14)	7.5 (16)	0.35 (13)	0.33 (13)	0.55 (16)	0.73 (3)	2 (1)	1.85 (16)	0.95 (14)	23.49 (16)	5.6 (10)	90	23.6 (16)	32
5	-	10.1 (8)	8.7 (3)	4.1 (4)	10.3 (12)	4.5 (3)	4.2 (7)	4.9 (8)	0.19 (4)	0.19 (2)	0.19 (6)	0.60 (1)	0.01 (3)	1.08 (4)	0.52 (11)	14.53 (12)	2.5 (4)	50	19.2 (11)	18
6	7.4 (1)	11.1 (13)	3.0 (2)	3.1 (8)	13.1 (14)	5.3 (11)	3.1 (11)	6.2 (15)	0.22 (8)	0.22 (4)	0.33 (8)	-	0.01 (1)	0.79 (8)	0.48 (10)	18.14 (16)	4.9 (14)	44	20.4 (14)	7
7, 8, 9	2.0 (3)	6.5 (22)	3.0 (4)	3.8 (17)	9.0 (25)	4.1 (23)	1.9 (18)	5.0 (26)	0.17 (16)	0.11 (4)	0.18 (17)	-	-	1.04 (21)	0.13 (4)	17.26 (26)	5.3 (15)	13	14.5 (26)	12
Overall average area per farmer	2.8	9.0	4.3	3.6	9.0	4.4	2.7	5.2	0.23	0.26	0.31	0.86	0.34	1.07	0.60	16.80	4.8	44	19.8	15
Percentage farmers reporting	11	66	21	35	93	68	79	95	54	34	68	15	6	71	67	102	49		98	

Figures in brackets indicate number of reports on which data is based.

TABLE VI.9 PADI CROPPING PATTERNS AND LAND USE 1972/73

Survey Area	Number farmers reporting			Percentage of farmers	Percentage of farmers having both hill and wet padi	Percentage of farmers with hill padi interplanted with other crops	Percentage of farmers with wet padi interplanted with other crops	Percentage of farmers with irrigated wet padi	Hill padi						Wet padi	
									Farmers reporting			Average temuda cycle years *	Farmers reporting land planted in 1972 planted previous years		Average number fallow years	Average number of successive years padi
	Hill padi	Wet padi	Both wet and hill padi						Primary forest	Secondary forest	Temuda		Yes	No		
1	2	6	6	100	33.3	0	0	0			2	6 (2)				3.5 (6)
2	5	8	8	100	62.5	100	12.5	12.5			4	6.4 (5)		1	6.7 (3)	1.8 (4)
3	8	17	18	100	38.9	62.5	11.8	17.7			7	6.7 (6)		3	5.9 (8)	5 (17)
4	16	14	16	100	87.5	87.5	0	0	1	1	7	5.1 (13)	1	3	1 (4)	6.2 (12)
5	3	7	8	66.7	25	66.7	0	28.6			3	5 (4)		3	2.5 (2)	3.8 (4)
6	11	11	15	93.8	46.7	45.5	9.1	18.2		1	8	5.25 (12)	1	9	3.3 (4)	3.8 (9)
7, 8, 9	23	18	26	100	53.9	4.4	0	0	5		9	5.8 (13)	2	18	3.2 (11)	2.8 (4)
Total	68	81	97	95.1	52.6	47.1	4.9	9.6	6	2	40	5.5 (55)	4	37	3.9 (32)	4.8 (56)
Per cent									13	4	85		10	90		

Note (*) Farmers who previously had hill padi also responed to this question in some cases.

Figures in brackets indicate number of reports on which data is based.

cent of farmers. Sixty-four per cent of farmers reported having perennials which included bananas, pineapples, citrus, coffee, some exotic fruits and jungle produce. Fish ponds were also relatively uncommon. Most farmers, 96 per cent, keep poultry but only 15 per cent housed their birds. Most birds are unimproved breeds. Pigs were less common being kept by 48 per cent of farmers; again mainly unimproved breeds.

VI.7.1 Padi

The overall average area of rice land per farm was 5.2 acres. The average hill padi area per farmer reported was 2.7 acres and wet padi farmers on average had 4.4 acres each. Fifty-three per cent of farmers had both wet and hill padi and 80 per cent of farmers visited had wet padi and 67 per cent hill padi, hill padi accounted for 56 per cent of the total rice area. Details by survey areas are given in Table VI.9.

(a) Cultural Practices

About half of the hill padi areas was interplanted with annual crops compared to five per cent of wet padi fields. Hill padi land was seldom cropped in successive years while wet padi land may be cropped for up to five years followed by four years of fallow.

Planting of hill padi, in general, takes place between July and September with the peak planting period occurring in September. Wet padi was planted somewhat later during August and September.

The main rice harvesting season was February and March. Wet padi was generally harvested before hill padi in February.

(b) Production and Yields

Padi yields for the 1972/73 season were low due to the prolonged drought which occurred towards the end of the year. 1971/72 and yield data were regarded as normal and are commented upon here.

The average hill rice yield was 74 gantangs (296.8 katis) of padi per acre. The best average survey area yield of 132 gantangs per acre was achieved in the Bekenu area. The average for the Bakong area was slightly lower at 114 gantangs per acre. The lowest yields were reported in area 5.

The average wet padi yield was 113 gantangs (453 katis) per acre. Again area 3 reported the best yields of 285 gantangs

(1 143 katis) per acre and area 5 had the next best yield of 182 gantangs (728 katis) of padi per acre. Areas 7 and 4 reported the lowest yields of about 55 gantangs. Details are given in Table VI.10.

TABLE VI.10 PADI YIELDS 1971/72 AND 1972/73 SEASON (GANTANGS PER ACRE)

Survey area	Hill padi		Wet padi	
	1971/72	1972/73	1971/2	1972/73
1	90	Nil	118	124
2	114	14	81	41
3	132	19	285	106
4	62	19	63	50
5	38	26	182	199
6	78	31	117	56
7, 8, 9	62	44	52	25
Overall average	74	29	113	59

(c) Processing

About half the padi farmers reported sending padi to commercial mills for milling. The charge for milling per picul of padi was about $1.70. Thirty-one per cent of farmers used longhouse rice mills owned by enterprising longhouse people. Only 13 per cent made use of co-operative mills and 10 per cent milled their own padi. Details are given in Table VI.11.

TABLE VI.11 PADI PROCESSING AND DISPOSAL

Survey Area	Number farmers reporting				Average charge per pikul of padi	Average price of rice bran (pikul)	Rice bran used for animal feed
	Own mill	Longhouse	Co-operation	Commercial			
					$	$	
1	4			2	1.50 (2)		
2		1		6	1.30 (6)	7.00 (1)	(6)
3	1	1	3	7	2.50 (1)	4.63 (8)	(7)
4		6			2.00 (4)	3.85 (7)	(13)
5		3		4	1.85 (9)	4.11 (8)	(7)
6	1	5	3	4	1.96 (15)	4.10 (15)	(13)
7, 8, 9	1	6	3	11	1.54 (26)	3.16 (24)	(24)
Total	7	22	9	34	1.70 (63)	4.71 (63)	(70)
Per cent	9.7	30.6	12.5	47.2			100

Figures in brackets indicate number of reports on which data is based.

(d) Disposal and Consumption

About 25 per cent of the production was sold as padi or rice

virtually all the rest was used for home consumption. Rice bran was used for animal feed. Padi was used for feeding livestock if surplus was available.

Fifty-five per cent of farmers growing padi indicated that the 1971/72 crop was insufficient for their food requirements. Some farmers borrowed from their neighbours to make up their subsistence requirements. Rice consumption per adult equivalent per year was estimated by two methods; the first was based on the amount consumed per family per day, and the second on production, with adjustments for stocks and disposal estimates over the year. Assumptions for calculating adult equivalents are given in Table VI.12. Average consumption estimated by the first method was 66 gantangs per adult equivalent per year. This is equivalent to about 395 katis of rice. Estimation by the second method gave an average figure of 81 gantangs where all farms were included without selection. If suspect figures are excluded the average consumption figure was reduced to 52 gantangs (347 katis). This appears to be a reasonably acceptable figure on the basis of these estimates but is high if compared to other estimates.

VI.7.2 Rubber

Ninety-one per cent of the farmers surveyed had rubber and 44 per cent of them had both RPS (rubber planting scheme) and non-RPS rubber. Seventy-four per cent of the rubber (70 per cent mature rubber and four per cent immature) was not planted under the RPS. Eighty-five per cent of all rubber was mature and of tappable age. The overall average area per farmer was about nine acres. Details are given in Table VI.8.

(a) Cultural Practices

Twenty-five per cent of rubber gardens were interplanted with other crops, particularly fruit trees; rambutans and bananas. Only 13 per cent of farmers reported using fertilisers on immature trees and two-thirds reported slashing gardens on average twice a year. Few farmers sprayed for weed or pest control. Details are given in Table VI.13.

(b) Tapping

If rubber is tapped, it is generally not tapped according to any recognised pattern. Only 27 per cent of tappable rubber was actually tapped (more RPS rubber was being tapped than non-RPS). Seventy per cent of farmers gave the reason for not tapping as labour shortage but it appeared likely that the real reason for this was low returns gained from this activity. However few farmers gave low prices as the reason for not tapping, thus it is the overall returns which would be of importance and this depends on yields, prices and the costs of inputs involved.

TABLE VI.12 PADI (CONSUMPTION, HARVESTS, DISPOSAL AND BORROWING)

Survey area	Number families reporting crop sufficiency for family consumption		Average consumption per adult equivalent based on daily consumption estimate	Average consumption per adult equivalent based on production, sales and stocks**		Estimation of rice consumed between 1971/72 and 1972/73 season. (All in gantangs)							
						Amount left before 1972/73 harvest	Amount left before 1971/72 harvest	Amount harvested 1971/72 season		Amount sold or disposed of	Per cent 1971/72 harvest	Amount borrowed	Per cent 1971/72 consumption	Total rice consumed
	Yes	No		Situation I	Situation II			Hill	Wet					
				gantangs	gantangs									
1	3	3	37.76	57.57	57.57			830.8 (5)	1447.3 (6)	666.6 (4)	29.2	245 (2)	13.2	1856.5 (6)
2	4	4	52.14	84.69	70.79	281.4 (2)	643.2 (2)	2251.2 (6)	2137.2 (7)	1387.2 (8)	31.6	300 (3)	8.2	3663 (8)
3	13	5	67.00	87.13	47.58	1085.4 (10)	740.3 (7)	2981.5 (7)	5791.5 (15)	2312.4 (16)	26.4	40.8 (2)	0.7	6156.3 (18)
4	8	8	82.71	115.26	62.69	201 (1)	395.3 (3)	395.3 (15)	2532.3 (13)	2437.1 (13)	32.7	491.3 (6)	6.0	8154.4 (16)
5	3	5	65.62	66.88	43.15	20.1		663.3 (4)	2634.1 (7)	592.6 (5)	16.9	108 (3)	3.6	2992.7 (9)
6	4	9	NA	69.82	45.46			3457.2 (11)	1715.2 (5)	1903.2 (10)	36.8	1477.2 (9)	28.0	5281.6 (15)
7, 8, 9	6	16	NA	75.57	70.23			4247.6 (20)	1668.2 (14)		0	1767 (20)	23.3	7582.1 (25)
Total	41 (45%)	50 (55%)	65.93	81.54	57.92	1587.9 (14)	1778.8 (12)	19362.6 (68)	18125.8 (67)	9299.1 (56)	24.8	4429.3 (45)	11.8	35686.6 (97)

Figures in brackets indicate number of reports on which data is based.

TABLE VI.13 RUBBER CULTURAL PRACTICES

Survey area	Number farmers surveyed	Percentage of farmers reporting interplanting	Percentage of total number surveyed farmers fertilising or not fertilising rubber				Farmers reported			
			Immature		Mature		Slashing		Spraying	
			Yes	No	Yes	No	Average number rounds	%	Average number rounds	%
1	5	100	40	60	0	100	2.5	80 (4)	0	0
2	7	43	0	100	0	100	4.0	14 (1)	0	0
3	15	40	13	87	0	100	2.8	73 (11)	0	0
4	15	60	13	87	0	100	1.0	27 (4)	1.6	53 (8)
5	12	0	30	70	0	100	2.8	92 (11)	0	0
6	14	0	0	100	0	100	1.3	86 (12)	0	0
7, 8, 9	25	0	11	90	0	100	1.2	64 (16)	0	0
Total	93	25	13	87	0	100	2.0	63 (59)	1.6	9 (8)

Figures in brackets indicate number of reports on which data is based.

(c) Production and Yields

The average yield of non-RPS and RPS together was 2.5 katis per 100 trees per tapping. Areas 5 and 3 reported substantially higher yields than the average, details are given in Table VI.14.

TABLE VI.14 RUBBER TAPPING AND YIELDS

Survey area	Number of farmers surveyed	Percentage of farmers surveyed reporting trees tapped on alternate days		Non RPS		RPS		Combined RPS and Non RPS	
		Yes	NO	Per cent tapped	Average yield per 100 trees	Per cent tapped	Average yield per 100 trees	Per cent tapped	Average yield per 100 trees
					(katis)		(katis)		(katis)
1	4	0	100	27	1.7	0	0	27	1.7
2	4	0	100	42	1.9	0	0	37	1.9
3	9	0	100	13	2.4	56	5.6	17	3.5
4	5	20	80	18	2.5	0	0	16	2.5
5	9	0	100	24	3.8	41	5.1	28	4.2
6	12	25	75	22	2.5	44	3.6	26	2.9
7, 8, 9	17	29.4	70.6	36	1.8	29	1.8	33	1.8
Total overall average	9	15	85	26	2.3	32	3.09	27	2.5

(d) Processing and Disposal

Farmers commonly shared or borrowed equipment from others for processing. Many do not own the basic equipment required such as coagulation boxes or mangles. A few farmers in areas 5 and 6 reported smoking their own rubber before selling it,

otherwise most farmers sold unsmoked sheets.

Many farmers were found to store their production because they had to wait for hawkers to come and collect it.

VI7.3 Pepper

Sixty-eight per cent of farmers surveyed had pepper vines of which about 53 per cent were mature (Table VI.8). In general towards the interior and Bintulu gardens were progressively smaller. The overall average garden size was 0.31 acres but those in the Niah and Bakong areas were larger than elsewhere.

(a) Cultural Practices

About 60 per cent of gardens are interplanted with crops mostly annuals. There was little difference in this regard between immature and mature pepper. About a third of the gardens had a drainage system of some sort and a quarter of pepper farmers had terraced their vines. Prominent operations in pepper planting are weeding, fertilising and spraying: on the average, weeding was reported to be done half a dozen times per year, fertilising two to three times and spraying three to four times.

(b) Harvesting Seasons

Picking berries was reported to start as early as January, but the main harvesting season was in April. Smaller crop peaks were reported by those who started picking earlier in January and February. In general the pepper harvesting season may be defined to extend from February to June in the Study Area.

(c) Processing, Yields and Storage

About 87 per cent of the berries were turned into white pepper and the balance were largely turned into black pepper because of uneven size and ripeness of berries collected in the last round of picking. There was thus a clear preference for white pepper in the survey area.

The overall average yield reported was 56.7 piculs made pepper per acre with the highest yields reported in area 2 were 131.9 piculs of green berries per acre was the average. Details are given in Table VI.15.

Overall 47 per cent growers were found to be storing pepper

TABLE VI.15 PEPPER CULTURAL PRACTICES PRODUCTION AND STORAGE

Survey area	Farmers having pepper		Percentage of gardens interplanted with crops		Estimated yield per acre (pikuls)	Percentage of farmers reporting storage of made pepper	Farmers reporting number of times per annum that they:				Farmers reporting drainage system
	No	%	Immature vines	Mature vines			Weed	Apply fertiliser	Spray	Terrace garden	
1	1	17	100	100	32			2			
2	6	75	80	50	132		12	3	3	17 (1)	33 (2)
3	14	87	71	63	43	33	4	1	2	36 (5)	29 (4)
4	16	100	77	62	49	19	6	3	6	6 (1)	25 (4)
5	6	50	NA	NA	60	67	8	2	2	50 (3)	83 (5)
6	8	50	25	NA	54	63	6	2	3	25 (2)	50 (4)
7, 8, 9	17	66	NA	NA	56	75	5	4	3	24 (4)	24 (4)
Total overall average	68	67	65	54	56	47	6	2	4	24 (16)	35 (24)

Figures in brackets indicate number of reports on which data is based.

at the time of survey with up to and over two-thirds in areas 5, 6 and 7.

VI.7.4 Annual Crops

Fifty-nine per cent of farmers had maize as their main annual crop, and this accounted for about 58 per cent of the area planted to annuals. About 27 per cent had other native vegetables accounting for about 40 per cent of the area and 30 per cent of farmers reported tapioca but the area planted was reported as insignificant. Average acreages reported for maize and vegetables were 0.7 and 0.8 acres respectively. The overall average area of annuals was about 1.1 acres per farm. Most gardens annuals were between 0.5 acre and one acre in size. Details are given in Table VI.16.

TABLE VI.16 DETAILS OF ANNUAL AND PERENNIAL CROPS GROWN (ACRES PER FARMER)

Survey area	Annuals				Perennials					
	Maize	Tapioca	Vegetable and other native crops	Total annuals	Bananas	Pineapples	Citrus (orange)	Coffee	Others	Total perennials
1	0.28 (2)	0.02 (5)	0.32 (6)	0.42 (6)	0.16 (5)	0.01 (2)	0.10 (1)		0.79 (6)	0.95 (6)
2	0.55 (5)	0.01 (3)	0.78 (4)	0.98 (6)	0.06 (4)	Neg. (3)	0.30 (2)	0.17 (2)	0.71 (6)	0.91 (6)
3	0.70 (5)	0.01 (8)	0.88 (2)	0.53 (10)	0.04 (16)	Neg. (10)	0.00 (4)	0.08 (2)	0.81 (5)	0.30 (16)
4	0.71 (16)	0.02 (8)	1.22 (15)	1.86 (16)	0.05 (13)	0.02 (12)	0.09 (7)	0.23 (1)	0.84 (14)	0.95 (14)
5	0.79 (4)	0.02 (2)	0.55 (2)	1.08 (4)	0.10 (7)	Neg. (3)	0.26 (5)	0.15 (2)	0.49 (7)	0.52 (11)
6	0.66 (7)	0.04 (2)	0.27 (6)	0.79 (8)	0.11 (7)	Neg. (4)	0.08 (1)	0.18 (4)	0.54 (6)	0.48 (10)
7, 8, 9	0.86 (21)	0.03 (3)	1.29 (3)	1.05 (21)	0.08 (1)	0.04 (2)			0.18 (2)	0.13 (4)
Overall average area per family	0.73	0.01	0.83	1.07	0.07	0.01	0.13	0.16	0.69	0.60
Percentage of farmers reporting	60	31	38	71	53	36	20	11	46	67

Figures in brackets indicate number of reports on which data is based.

VI.7.5 Perennial Crops

The main perennials reported were bananas and pineapples but the acreages were small. Coffee and citrus were quite important perennials for a small percentage of the farmers (11 per cent and 20 per cent respectively had them). Other jungle fruits made up quite a substantial area with an average of 0.7 acre per farmer and were reported by 46 per cent of farmers. Overall, the average area of perennial crops was 0.60 acre but the majority of farmers had about 0.2 acre. Details are given in Table VI.16.

VI.7.6 Fish Ponds

Very few farmers covered by the survey maintained fish ponds.

VI.7.7 Pigs

Although only 49 per cent of farmers reported keeping pigs, it should be borne in mind that some would not have kept pigs on religious grounds. On the average farms having pigs had about four animals each.

(a) Husbandry Practices

The mortality rates reported for pigs was high, about 23 per cent were said to have died from diseases of some sort. The ratio of sows to boars at 3 : 1 is rather low. Sows were reported on the average to have 1.4 litters during the year.

Pigs were fed mainly on rice bran, kitchen waste, yams and tapioca together with small amounts of sweet potatoes, maize, sago and greens. None of the farmers in the survey reported using imported or commercial feed.

(b) Disposal and Consumption

Thirty-five per cent of farmers slaughtered some of their pigs mainly for festive days the average number slaughtered was 1.35 animals per annum.

Twenty-five per cent of farmers reported selling pigs to nearby bazaars or hawkers and on average sold 1.67 pigs during the year. The average selling price of live animals was $1.02 per kati, but ranged from $0.08 to $1.20 per kati liveweight for various sizes of animals.

VI.7.8 Poultry

(a) Husbandry Practices

Most of the fowls kept were found to be native fowls. On average 20 birds were kept per bilek. Only 15 per cent of farmers reported housing their fowls. The most common feeds were padi, rice bran, kitchen waste, maize and a local grain known as 'barley'. Only four per cent of farmers reported buying commercial feed.

Most slaughtered birds were killed when they were over a year old.

(b) Consumption and Disposal

Slightly more than two-thirds of the off-take from flocks was consumed by farmers themselves, and the rest were sold. Relatively few farmers sold their birds (20 per cent sold on average 12 birds each). The average selling price reported was $1.80 per kati.

Eggs were not normally sold but consumed by farmers themselves, only about 16 per cent of farmers reported having eggs for home consumption. Few day-old chicks were bought for flock establishment improvement.

VI.8 FARM INPUTS

According to kampong headmen, inputs like fertilisers, weedicides and insecticides were commonly used by farmers. Ninety-two per cent of kampongs reporting using fertilisers, 86 per cent weedicides and 75 per cent insecticides.

Seventy-six per cent of the farmers included in the survey reported using fertilisers, 55 per cent weedicides and 38 per cent pesticides. The use of inputs appears to decline towards the interior generally.

Though only four per cent of poultry keepers indicated that they had bought chicken feed overall 22 per cent of farmers had bought animal feed of some sort.

VI.9 FARM EQUIPMENT

(a) At Kampong Level

Mangles were the most common item of equipment among rubber planters, some 82 per cent of the kampongs had them and on average one out of three farmers with rubber owned one. Areas

5 and 7 had more mangles per farmer than other areas. Crop sprayers were reported by one out of three bileks surveyed.

Forty-three of kampongs had rice mills and 37 per cent had bicycles. Only 22 per cent of the kampongs had vehicles of some kind but all had boats. Only 10 per cent of kampongs or longhouses had wheel barrows.

(b) At Farm Level

Here three categories of equipment may be distinguished. Nearly all farmers had small tools such as parangs, harvesting knives, changkols, baskets and gunnies of various sizes. The second category of items consisted of tapping knives, coagulation boxes, sprayers, mangles and spades and the percentage of farmers having these items in survey areas was within the range from 35 per cent to 67 per cent. Only a small number of farmers were found to have smoke houses and wheel barrows which comprised the third group.

VI.10 CO-OPERATIVES AND CREDIT

Co-operatives did not appear to be popular among the farmers covered by the survey. Only 10 per cent of the kampongs had co-operatives functioning in them. Farmers in all areas except 3 and 2 expressed no interest in having a co-operative organisation. A successful co-operative was reported in area 3 near Bekenu at Satap.

Credit for fertilisers and other inputs was commonly reported in areas 2, 3 and 4 due to perhaps greater involvement in pepper growing as well as the availability of agricultural inputs from local dealers. Farmers reported credit was obtained for consumers goods but there was considerable variation from one kampong to another and between areas. Transaction ties similarly varied from place to place depending on local circumstances and communications. Freedom of choice was restricted by poor communications and the limited number of dealers or hawkers operating in any particular area.

PRINTED AT THE GOVERNMENT PRINTING OFFICE, KUCHING, SARAWAK,
VINCENT KIEW FAH SAN, K.M.N., P.B.S., A.B.S., GOVERNMENT PRINTER.