

THE GOVERNMENTS OF MALAYSIA AND STATE OF SARAWAK

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**MIRI—BINTULU**  
**REGIONAL PLANNING STUDY**

**MAIN REPORT**

**VOLUME II**

Hunting Technical Services Limited

London

Hoff and Overgaard

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## CHAPTER 1

### THE PHYSICAL ENVIRONMENT

#### 1.1 INTRODUCTION AND HISTORICAL BACKGROUND

The Study Area shown in the Regional Plan Map covers about 3.5 million acres or roughly 37 per cent of the Fourth Division. In the past the pattern of land use throughout the Fourth Division has been similar to the rest of Sarawak. The rivers have been the highways of the country and people have settled along their banks, forming narrow bands of villages, longhouses and cleared land extending from the estuaries far inland. Most of the remaining land between the larger rivers has been left relatively undisturbed. This was particularly true in the Study Area and only recently have some roads been constructed, often for the logging of hill forests, resulting in settlements spreading away from the rivers.

The river estuaries were the gateways of the country and became important sites for villages of the Malays and Melanaus, relics of the Muslim arrival in the Fifteenth Century. These coastal settlements are generally in a swamp environment, where the main occupations of the people are fishing, the cultivation of rice, coconuts and sometimes sago. The hilly, rugged and forested inland areas close to the rivers are where the shifting cultivation of hill rice of the longhouse people takes place. The areas where coastal and inland groups meet are also generally the sites of immigrant Chinese rural settlements. These settlements, though often predominantly Chinese with title to much of the land they work, also contain farmers of the other main ethnic groups who, to a large extent, are adopting the Chinese pattern of settled agriculture. Rubber, pepper, vegetables, swamp rice and coconuts are the main crops. The Chinese in particular also rear poultry and pigs.

The vast majority of the land, some 80 per cent, is still covered with forest; roughly half of this is Forest Reserve and Protected Forest, very little of which has yet been exploited. Plans are ready for the controlled use of the virgin Mixed Dipterocarp Forest as the base for several large timber industry complexes, and most of the other forest areas have been licenced for logging and are the source of a long established log export industry.

Exploitation of the oil and gas deposits around Miri since 1910 has been the main reason for the relatively advanced stage and size of Miri town. There is an oil refinery at Lutong, just north of Miri, and recent off-shore discoveries of oil and gas equidistant between Miri and Bintulu have instigated plans to establish a liquified natural gas (LNG) plant expectedly at Tanjung Kidurong.

Other mineral resources are not great. Antimony has been found in several places but the potential for a large mining industry does not appear to exist. Silica sand (for glass) is being extracted on the coast just north of Bintulu. The quality and known reserves of this sand are sufficient to support a large glass product factory.

The presence of limestone near Long Lama and the existence of other raw materials necessary for cement production, together with cheap natural gas from Miri, provide the resource base for a cement plant near Kuala Baram. Other

out-crops of limestone occur, but are widely scattered and generally small, except for the huge out-crop at Niah which provides the only easily accessible source of stone for road construction. Here too, however, are the well-known Great Caves which, together with surrounding virgin forest and limestone cliffs (soon to be made into a National Park), provide the only real tourist attraction in the Region. It is of particular importance ecologically for its community of bats and swiftlets.

## 1.2 THE CLIMATE

The Climate is wet tropical with constantly high relative humidity and temperature. Although influenced by the north-east and the south or south-east monsoons, there is no distinct dry season: in fact there are no clearly definable seasons. Heavy rains or several weeks of drought can occur at any time of the year, though the wettest period tends to be October to January—the period of the north-east monsoon. The range of mean annual rainfall is from about 100 to 200 inches and high intensity rainstorms are common. Sunshine hours tend to be inversely related to rainfall; Bintulu, with a higher rainfall than Miri, has considerably less sunshine than Miri. Over the period 1959 to 1968 the average annual sunshine hours per day were 5.8 and 6.7 respectively for Bintulu and Miri.

These climatic conditions impose limitations as well as providing potentials for agricultural and forestry development. The year-round expectation of rainfall generally favours perennial crops and forest trees which can take advantage of the practically continuous growing weather; but most annual crops require a predictable dry period to promote ripening and for harvest.

## 1.3 WATER

The surplus water from the area, resulting from the heavy precipitation, is drained through a number of streams and rivers, the most important of which are the Baram and Kemena. These rivers, and some of the others, are navigable by small, shallow-draft vessels up to a certain distance from the mouth, beyond which longboats are used, nowadays often equipped with an outboard motor.

The water level of the rivers varies substantially with the precipitation, causing flooding of certain areas. Apart from the towns, which have treated and piped supplies, the water consumed by human beings and animals comes from either the rivers or collected rainwater. Groundwater, although present, especially in the coastal areas, is not used. The rivers are able to supply large quantities of water for domestic and industrial purposes; but if fresh water is needed for industries it may be necessary to locate them upstream or to pipe water to them to avoid the saline conditions that extend some way up from the coast because of tidal fluctuations.

There is already discernible pollution of the rivers and coastal waters due to current land use systems, and the risks of aggravating this condition and disturbing the river regimes in the course of large scale land development has been an important factor in development planning. Natural water supplies are abundant, but extensive misuse of land could seriously reduce the reliability and value of this resource.

There is no potential for large scale hydro-electric power generation in the Study Area.

## 1.4 LAND RESOURCES

### 1.4.1 Topography and Soils

The general configuration of the land in the Fourth Division is a gradual rise from low-lying coastal plains to high mountainous hinterland through a broad intermediate tract of alternating ridges and valleys. The slopes in this tract are mostly short and steep, and the directional trend of the ridges north-east to south-west.

Although there are some large peat swamp areas associated with the bigger rivers, most of the land in the Study Area can be described as undulating to rough, with average slopes in excess of ten degrees. According to a broad transect survey of about 1.5 mn acres of land in this category, the approximate percentage distribution of land based on maximum slopes was as follows:

<i>Range of slopes (degrees)</i>	<i>Approximate percentage of land</i>
up to 5	8
6 to 10	2
11 to 20	26
21 to 25	14
over 25	50

The soils are variable; but with a general tendency to be shallow, of medium to poor natural fertility and a hazardous susceptibility to slip and erosion.

In general, therefore the terrain and soil constraints to agricultural development are considerable, especially in relation to attempts to diversify from perennial crops. The paucity of flat, or very gently sloping land and the problems associated with flooding and poor drainage on such land, restrict the possibilities for arable annual cropping. In addition, in the undulating and hilly areas a high percentage of land with slopes between 21 and 25 degrees has soil depths of less than 24 in. This can be rapidly reduced by erosion once the natural vegetation has been cleared. Thus conservation measures to control erosion are essential, and where the soil depth is generally less than 24 in., cropping of any kind is inadvisable. Land with average slopes greater than 25 degrees is unsuitable for agricultural development.

Peat swamps are also at present unsuitable for agriculture and so far research has failed to show a satisfactory large-scale method of using them. However, these swamps and the hilly land too steep for agriculture are generally suitable for permanent forestry development.

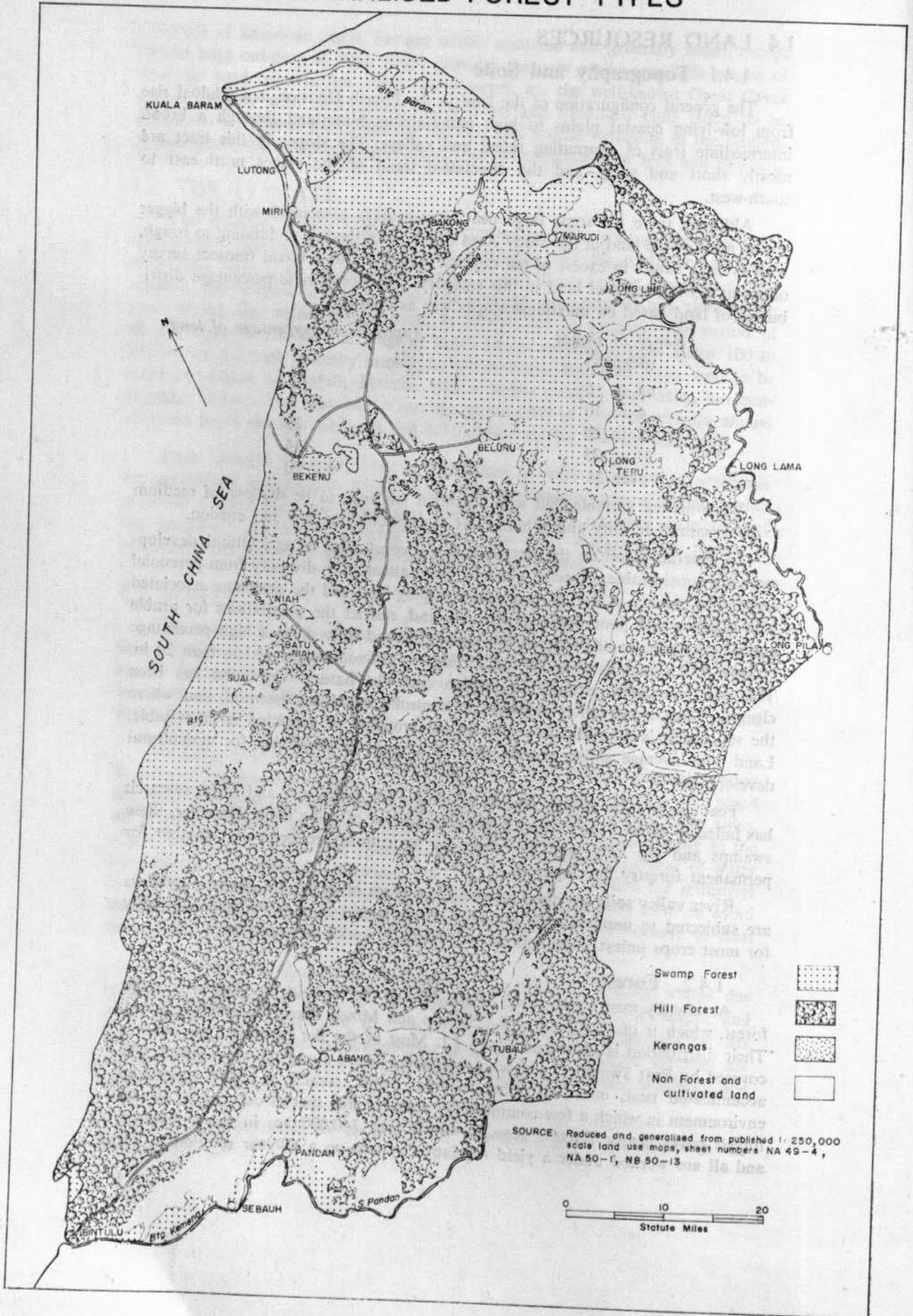
River valley soils are often suitable for a range of crops, but almost all valleys are subjected to unpredictable flooding, which makes them of limited suitability for most crops unless flood control and drainage works are undertaken.

### 1.4.2. Forests

As already mentioned, some 80 per cent of the land in the Region is under forest, which is of two main types; Swamp and Mixed Dipterocarp (Hill) Forest. Their distribution is shown in Figure 1.1. Most of the flat land near the coast is covered by Peat Swamp Forest with extensions inland along the main rivers. The accumulated peat, often extending to great depth, creates a highly specialised environment in which a few commercially valuable tree species occur. Peat swamp forests cover nearly 700,000 acres of which over 340,000 are in forest reserves, and all are worked under a yield regulation system on a 60-year rotation.

# GENERALISED FOREST TYPES

FIGURE 1-1



Non-swamp forest is predominantly Mixed Dipterocarp, a complex association of over 600 species producing many valuable hardwoods of different grades, and aggregating well over two million acres. Under present conditions inaccessibility and the diversity of the trees makes profitable working difficult, and hitherto logging has generally been limited to about ten tons Hoppus per acre, often confined to trees exceeding 20 inches in diameter that could be floated down the rivers. But this is no indication of the potential timber yield using modern extraction methods and processing techniques capable of utilising smaller diameter trees. Of the 630,000 acres of virgin forest planned to be utilised by the timber complexes recommended by the FAO Team and lying within the Study Area, 450,000 acres are classed as high volume density.

### 1.4.3 Present Land Use

Forest covers roughly 2.8 mn acres. About 600,000 acres are, or have been, under cultivation of some sort, while settlements and non-agricultural lands total roughly 54,000 acres. A further approximate breakdown of these acreages is given in Table 1.1.

By far the most common type of farming is the shifting cultivation of hill rice. Under conditions of low population density and abundant land, such as presently exist in the Study Area, this type of agriculture is not particularly destructive of land, but these conditions are fast disappearing and development will accelerate the process in all parts of the area. Thus pressure on the land will increase, resulting in progressively shorter periods of restorative forest fallow between successive crops leading to a rapid reduction of the productivity of the land and eventually to disaster.

A type of agriculture, at present unique to the Study Area, is progressing in the Lambir-Subis Development Area. Here pure stands of oil palm are being established on a large scale estate basis by the Sarawak Land Development Board (SLDB) as public estates, and by the Sarawak Oil Palms (SOP) as a joint venture between the Sarawak Government and the Commonwealth Development Corporation. This development and the overall pattern of present agriculture are depicted in Figure 1.2, where the river-based cultivation is also clearly shown.

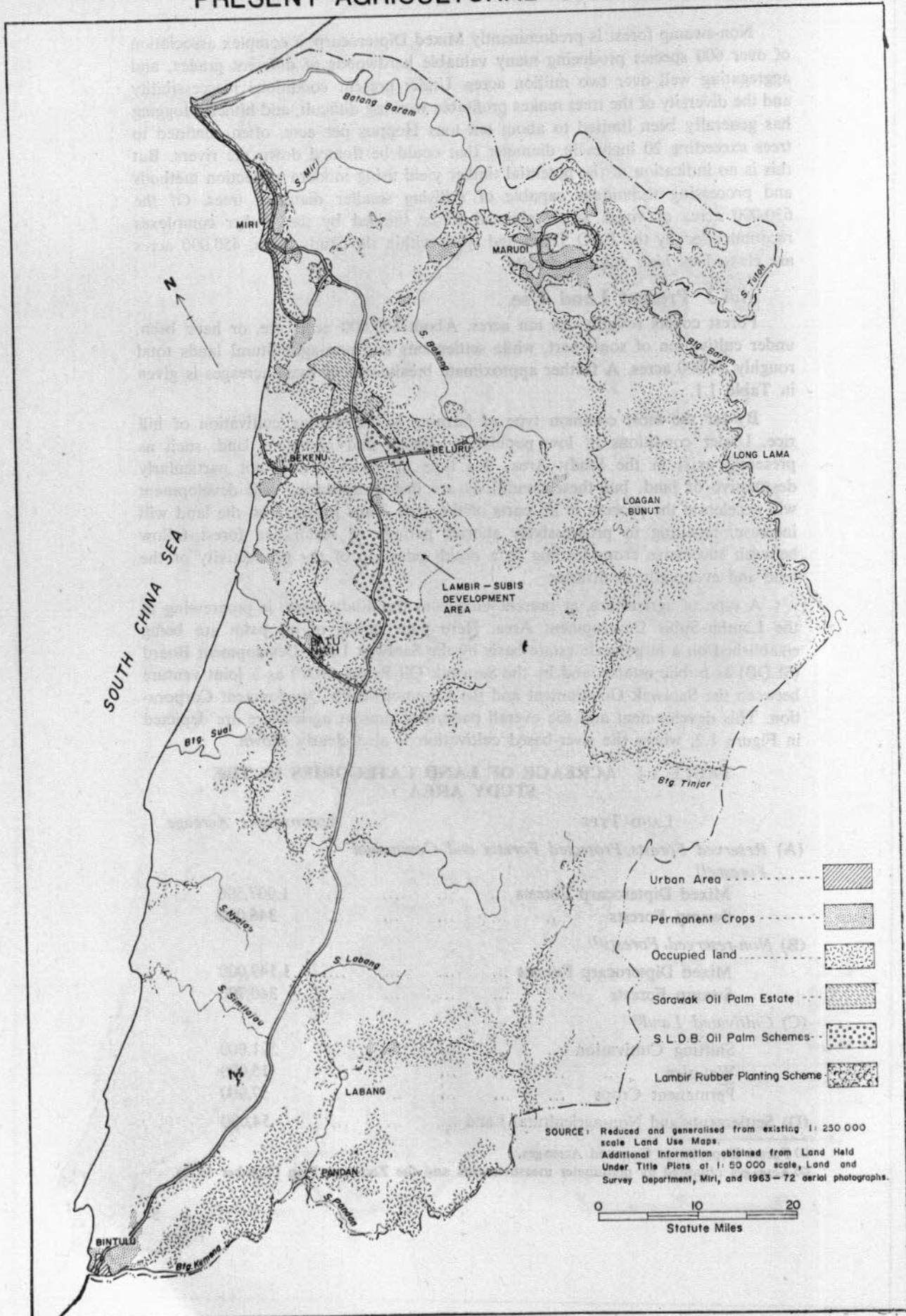
TABLE 1.1 ACREAGE OF LAND CATEGORIES IN THE STUDY AREA

LAND TYPE	Approximate Acreage
<b>(A) Reserved Forests, Protected Forests and Communal Forests<sup>(1)</sup></b>	
Mixed Dipterocarp Forests ... ..	1,007,500
Swamp Forests ... ..	346,000
<b>(B) Non-reserved Forests<sup>(2)</sup></b>	
Mixed Dipterocarp Forests ... ..	1,149,000
Swamp Forests ... ..	340,700
<b>(C) Cultivated Land<sup>(2)</sup></b>	
Shifting Cultivation ... ..	521,000
Wet rice ... ..	15,000
Permanent Crops ... ..	57,000
<b>(D) Settlements and Non-agricultural Land ... ..</b>	<b>54,000</b>

(1) Forest Department Gazetted Acreages.

(2) Acreages obtained by planimeter measurements and the Zonation Plan (October 1972).

# PRESENT AGRICULTURAL SITUATION



SOURCE: Reduced and generalised from existing 1:250 000 scale Land Use Maps. Additional information obtained from Land Held Under Title Plots at 1:50 000 scale, Land and Survey Department, Miri, and 1963-72 aerial photographs.

0 10 20  
Statute Miles

The almost total absence in the past of estates, either public or private, or of large farms run by economically independent farmers has been important in constraining diversification of cropping. Smallholders and longhouse communities have usually had neither the means nor the technical knowledge to undertake new enterprises. They have generally been too occupied obtaining a subsistence living, and very often any surpluses of food or other products they have had for sale have been too limited or too scattered to permit the organisation of efficient processing and marketing.

Generally the longhouse people hold their land under Native Customary Law, which in the past has allowed rights to be established by the felling of virgin jungle. Since the amendment of the Land Classification Ordinance 1955, the establishment of Native Customary Rights to land has, in theory, been restricted to areas where Government permission for such acquisition has been granted. In practice, however, considerable illegal occupation of land has occurred in many parts of the Area and is continuing. Particularly conspicuous is the haphazard occupation of land along forest logging roads and along the Miri-Bintulu Road. This practice has already caused disruptions in the smooth opening-up of the Lambir-Subis Development Area and it could become a serious constraint to the planned development of State Land. Very often the type of agriculture introduced into these illegally occupied areas is shifting cultivation of hill rice.

#### 1.4.4 Availability of Land for Development

An important directive in the Scope of Work for this Study was that new agricultural development should be located, as far as possible, on unencumbered State Land. The land which offers the greater opportunity for early agricultural development aimed at settling people from other parts of Sarawak is that land outside reserved and protected forests which has been logged or is currently under licence. Preliminary land classification based on existing information (up to 1972) and the study of aerial photographs indicated that about 1.3 mn acres of the Study Area were possibly suitable for agricultural development while 2.2 mn acres offered only very limited scope for agricultural development. Of the possibly suitable land the more accessible and potentially accessible parts were soil surveyed at a broad transect level and a total of roughly 600,000 acres were identified as having high proportions suitable for agriculture. (See Regional Plan Map). The total is made up of:

- (a) about 170,000 in existing Forest Reserves and Protected Forests;
  - (b) about 210,000 in forest land outside existing forest reservation and protection areas;
  - (c) about 210,000 in land presently occupied;
- (a) and (b) can be considered as unencumbered, but (b) is the category of suitable land most readily available.

In addition some 160,000 acres were preliminarily assessed as being possibly suitable for agriculture, but most of this land is already occupied. Probably the greater part of the occupied land is legally occupied, but considerable acreages have been illegally cultivated. Adjudication of legal boundaries must precede planned development of these areas.

The acreages quoted above are maximum figures; there will be less land found suitable for agriculture when more detailed soil investigations have been carried out—as they must be in all the areas except about 100,000 acres already surveyed

during this Study. The area of land that will eventually be found suitable for agriculture is estimated to be about 70 per cent of the areas identified at the broad transect level and 50 per cent of the areas assessed as possibly suitable. Thus the acreages previously mentioned are expected to be reduced to approximately:

- 120,000 acres in existing Forest Reserves and Protected Forests,
- 145,000 acres in unreserved and unprotected forests,
- 230,000 acres in land presently occupied.

An estimated total of approximately 500,000 acres, more than half the presently occupied land, was assessed as unsuitable for agricultural development.

## 1.5 COMMUNICATIONS

From the point of view of development an extremely important feature of the physical environment is the difficulty of transport and communication. At present road communications are poor. Many parts of the Study Area are accessible only by longboat. In the past the lack of roads has been a constraint to agricultural and forestry development, and even now the majority of production inputs and marketable products are transported by river despite the completion of the Miri-Bintulu Road. But this is only a temporary situation. The construction of the roads planned as part of the overall State programme, together with a subsidiary network for Regional development, would change the whole pattern of accessibility and the movement of goods.

Coastal traffic is overwhelmingly the most important for the movement of goods into and out of the Study Area. Sand bars at the mouths of the rivers and the shallow continental shelf along the whole coast are features which preclude the rapid and efficient loading and unloading of goods and hinder the development of sea borne transport. There is a great need for port facilities.

Air communications are of fairly recent origin, but are steadily improving. There are daily scheduled flights connecting Miri and Bintulu with Kuching, Brunei and Sabah. There is also a light plane service to Marudi. The runway at Miri is being improved to standards suitable for medium sized jet aircraft, while extensive surfacing of the Marudi runway are practically complete.

## 1.6 CONCLUSION

The Study Area has a great potential for development based on its valuable forest resources and certain categories of land capable of reasonably diversified agriculture. The development would absorb a substantial increase in population; but extremely careful land planning and management will be essential if the erosion hazards, inseparable from development in local circumstances, are to be kept within reasonable bounds.

## CHAPTER 2

### SOCIAL STRUCTURE AND MANPOWER

The quantitative aspects of population have been dealt with in Volume I Chapter 2. The present chapter discusses the qualitative aspects, namely the ethnic, cultural and educational characteristics of the population. In the Plan the population is both an end and a means for development. Whereas the ultimate aim is to improve living conditions for the people themselves, they, with their qualities and abilities, form part of the resources to achieve that aim. It is therefore necessary to review the traditional characteristics and social structure of the different ethnic groups, to understand their attitudes towards modern forms of development and their expectations of it.

#### 2.1 THE SOCIAL STRUCTURE

The population in the Study Area is part of a multi-racial society made up of diverse cultural and linguistic groups, as follows:

	<i>Per cent</i>
Iban ... ..	35
Chinese ... ..	30
Malay ... ..	15
Melanau ... ..	7
Other indigenous ... ..	13
Total ...	<hr/> 100 <hr/>

A large share of other indigenous are Kelabits, Kayans, Kedayans, Kenyah, and other people most of whom, like the Ibans, are living in longhouses. The locational grouping of different races can be traced back to the effects of early settlement policy and the nature of the people's occupation.

The Chinese and Malay populations mainly live in urban and semi-urban areas. Melanaus are concentrated close to good fishing opportunities, especially in Bintulu. The Ibans are evenly spread over all Districts and, like the other indigenous people, mostly along all major rivers.

A basic goal at which the Plan aims is to restructure society so that inter-relationships between ethnic groups are strengthened by reducing their identification with specific economic functions, accelerating modernisation and expanding the participation of all communities in an integrated, developing economy. But the needs of the different groups making up the society are not the same. The least integrated segment in the present population consists of rural communities dependent on shifting cultivation. Several years ago Government started a series of programmes designed to persuade shifting cultivators to adopt more permanent forms of agriculture. The success of these programmes, although limited in some respects, is evidence of a general receptivity in the rural people to new methods. Tradition itself, in most cases, appears to be less of a hindrance to development than technical and economic factors. The traditional cultural values generally

encourage individual resourcefulness and foster an outlook open to innovation; but at the same time, the traditional social organisation offers a degree of security of great importance to these people. This social structure, therefore, is only likely to be abandoned when the relative advantages of new methods and organisations have been amply demonstrated.

The longhouse settlements are generally located along rivers or streams, which in the Study Area are still the principal avenues of communication. This pattern of settlement is expected to change as road transport increases in importance and as areas of agricultural potential are opened and linked to road-supplied trade networks. This will be expected to encourage more people to settle close to the roads. Demand for consumption goods will grow and can be expected to stimulate incentives for cash-crop production and the adoption of better methods of farming.

Present rural communities engaged in stationary agriculture are highly varied and the practice of settled farming is not exclusive to any one ethnic group, but it is a rough index of modernisation. The economic returns to labour for settled farmers growing basic crops, such as rice, are frequently low and considerable scope exists for improving productivity and diversifying output. Intensive market garden farming is already highly diversified, and those engaged in this form of agriculture are keenly aware of the value of land improvement and careful management. However, land holdings are typically small and often fragmented.

From the First, Second and Third Divisions there is considerable out-migration of people to the urban areas, but often there are no ready employment opportunities in the towns. Most people therefore feel that possession of land and engagement in modern agricultural pursuits represent an important practical answer. While the Chinese are the most conspicuous group presently engaged in an intensive type of farming, other groups are beginning to follow suit. The expansion of educational, extension and credit services, envisaged as an integral part of rural development in the Plan, will help to accelerate this trend.

In contrast to other farming communities, Chinese smallholders have adopted a dispersed pattern of settlement focussed around schools or secondary rural bazaars. The absence of a village organisation is usually compensated for by an easy access to larger population centres, ties of clanship and the existence of formal associations based on dialect or common interest. Most Chinese communities have considerable experience with formal organisations such as school or cemetery committees; however, the organisations designed specifically to promote farming interests have been slow to develop, although, once they take shape they are often highly effective. Nevertheless a significant urban migration in the Study Area is foreseen based on the recent evidence of accelerated movement of indigenous peoples to Miri and other towns where wage employment is available. In this respect, the Study Area appears to be somewhat in advance of the rest of Sarawak due to its oil, gas and timber industries. If this movement continues uncontrolled it will create problems.

Movement to towns should be the result of new jobs attracting people and not of surplus people drifting to the towns in unsuccessful attempts to find jobs. Any new influx creates an immediate need for housing and social services to facilitate a difficult transition.

The integrated development proposed for the Study Area, involving agriculture, and other rural developments and the planned 'urbanisation of rural areas' explained in Chapter 6 are designed to prevent or reduce this undesirable drift to

towns. It is recommended that social welfare units are established in the towns to help new urban migrants to adapt themselves to the new conditions.

The traditional social structure in the Study Area (and in Sarawak) can broadly be described as one in which the various racial communities have a life style and culture:

- the longhouse people, Ibans, Kayans, Kenyah etc.—living mostly as hill padi growers, with some additional rubber and pepper growing and cash income from logging;
- the Malays, living in villages, along river estuaries; fishing and growing wet padi are their main occupations;
- the Chinese, living partly from the land cultivating various cash crops and rearing small livestock, and living partly from commerce, industries, financing and similar 'urban activities'.

This social structure has been under moderate change for a long time, especially in towns where the different ethnic groups often begin to lose their particular occupational characteristics. With the implementation of planned development in the Study Area this change of social structure and of culture will accelerate over the next 20 years because of increased urbanisation, introduction of modern agriculture on a large scale, improvement of agriculture in areas predominantly engaged in traditional cultivation, improved and uniform education, and of improved and expanded systems of transport.

These changes should not be seen merely as a result of wishing to create a modern, progressive society, but because of:

- necessity: the traditional production systems are insufficient and inappropriate to cater for the growing population;
- desirability: people's awareness of new possibilities for their lives and their desire to realise them.

Out of these changes will emerge a new culture unique to Sarawak and congenial to the people. The pace and the ease of this transformation will depend largely on the ability of the people to adjust to the new conditions.

## 2.2 ABILITY TO RESETTLE

The ability of different ethnic groups and individuals to migrate and settle under new conditions will depend on cultural background as well as on personal characteristics; some people are more open-minded, more adventurous, better able to orientate themselves than others, and some cultures are more 'settled' and rigid than others. Because much of the planned development is based on attracting people from other parts of Sarawak and settling them under vastly different conditions, the characteristics and ability of the various community groups to adjust themselves to new situations were studied by Sociologists in the Consultants' team. Their findings and recommendations are presented fully in Supporting Report 4, from which the most important points are given below.

Ignoring individual motives for migration, two important cultural factors were found to be fundamental to a person's ability to adjust to new work and social surroundings:

- attitudes to leadership and ability to co-operate and work as a member of various kinds of groups;
- habits of work learned from past experience.

The former is largely derived from the structure of the society; the latter from the modes of economic production.

### 2.2.1 The Social Structure of Different Ethnic Groups

Chinese immigrants easily organise themselves into functional groups under institutionalised leadership for economic, social, political and religious purposes. This ability to form groups and produce leaders probably arises from their patrilineal inheritance system, whereby the male descendants constitute a property-holding corporation with many functions other than purely economic ones. This makes the Chinese as a group good pioneer settlers.

No indigenous society in Sarawak organises itself in this way. Their family organisations do not easily lead to the formation of clearly demarcated kinship groups wider than the simple family household as far as the handling and transmission of property are concerned. Indigenous societies in Sarawak rely on other criteria, such as neighbourhood, special skills, common interests and personal liking, in the formation of groups. Groups established on such criteria are likely to be unstable, and only those concerned with tangible assets, such as the farming lands associated with a village, are likely to have continuity. The heads of the separate households do not easily acknowledge the permanent superiority of any one of them. Consequently institutions of leadership for organising the variance tasks of social life are usually on an *ad hoc*, temporary basis.

A background of this kind will have an important bearing on the habits of co-operation and leadership which a migrant brings to a settlement scheme. In such peoples' traditional environment there are few situations which cannot be met by well known responses, but in a new environment migrants will have either to adapt their traditional responses to problems of leadership and group co-operation or accept wholly unfamiliar answers.

### 2.2.2 Modes of Production

The growing of hill padi under a system of shifting cultivation usually means that the men in a community are required only for a relatively short period in each year to clear a new section of the forest and prepare the ground by burning the felled trees. Men often help in the planting, weeding and harvesting of the crop, but their labour is not essential. It is the women who undertake these prolonged, but not unduly heavy, tasks. To a large extent the men are freed for the traditional, and economically essential, work of hunting and gathering in the forest and for travel and, formerly, warfare. Under traditional shifting cultivation conditions land is abundant, while labour in certain periods is scarce and newcomers are therefore usually welcomed into the community.

In production systems based on wet rice farming, which is the original background of most Chinese communities in Sarawak, the scarce resource is land in the form of highly capitalised fields. Suitable land for this type of cultivation is often limited with little room for expansion; consequently fields are intensively cultivated year after year. The members of a society farming under these conditions do not wish to attract outsiders and are often obsessed by the need to exclude strangers. Also the notions of capital and its preservation are usually highly developed. This is not the case in societies based on shifting agriculture. A farmer educated in this system may find it difficult to value a plot of land as a piece of developed capital, and he will not have the same working habits as a man reared

in the orderly daily routine of stationary farming, where continuous and arduous work is as much the task of men as of women. Indeed he may feel that his sense of identity as a man is under attack if he is forced into such work, except as a temporary measure. This can then be seen as an incident of travel and short term labour migration, as happens, for example, with Iban and Melanau workers in the logging industry or with gangs of Iban men engaged in clearing land for agricultural schemes or road construction.

### 2.2.3 Actual Migration

At the present time permanent migration between Sarawak and the rest of Malaysia is negligible and virtually all population movement involving permanent resettlement of individuals or communities occurs within the State. However Census data on this migration do not exist for Sarawak. Therefore migratory trends can only be inferred from less direct sources. An estimate of migratory patterns was obtained by a comparison of population growth rates by administrative District. The District boundaries used are those that existed at the beginning of the Study; the time interval involved is the most recent intercensus period, 1960 to 1970. The method adopted compares the percentage of population increase by District with that for Sarawak as a whole. It is assumed that Districts with a higher percentage increase than the State average are areas of in-migration, while those with a lower percentage increase are areas of out-migration, and that the magnitude of departure from the average may be taken as a rough measure of the scale of net migration. The total calculated net migration amounted to approximately 31,000 persons.

The migratory trends observed are presented in Table 2.1 which shows that:

- in the First Division, the Districts of Kuching and Serian have absorbed approximately 70 per cent of the net internal migration;
- in the Fourth Division, the Miri and Bintulu Districts have absorbed approximately 30 per cent; while
- Second, Third and Fifth Divisions have had net out-migration, the greatest occurring in the last two Divisions.

There is no way to determine the exact source of in-migrants to the Study Area but sociological field surveys carried out by the Consultants, give a general picture of the situation of the main groups present. The survey of The Lambir Smallholder Rubber Scheme, the only well-established rural development scheme in the Study Area, shows that the place of birth of the settler population in this scheme is somewhat biased towards Ibans and the Second Division, but otherwise appears to be generally representative of the existing pattern of rural migration between Divisions.

In the future the number of migrants to the Study Area will increase, but the precise composition of the migrants will depend on the role the Government assumes in guiding migration, and on the employment opportunities created by public and private development in the Study Area and elsewhere in Sarawak.

TABLE 2.1 POPULATION CHANGE, 1960-1970

Census District	Percentage Change in Population		Total Percentage Change Per District	Per Division	Apparent Net Population Movement
	Indigenous Population	Chinese Population			
1st Division:					
Lundu ... ..	40.0	10.7	33.1	39.9	+21,900
Bau ... ..	40.2	6.7	27.9		
Kuching ... ..	50.4	38.5	43.7		
Serian ... ..	43.6	39.7	43.5		
Simunjan ... ..	33.0	-4.3	26.2		
2nd Division:					
Simanggang ... ..	34.4	49.71	36.2	25.4	-6,200
Lubok Antu ... ..	9.4	2.7	8.4		
Saribas ... ..	24.7	5.5	22.9		
Kalaka ... ..	22.3	18.6	21.9		
3rd Division:					
Sarikei ... ..	26.3	18.5	22.2	22.0	-23,800
Binatang ... ..	14.6	13.7	14.2		
Sibu ... ..	39.3	21.2	27.2		
Kanowit ... ..	19.8	-12.7	15.1		
Kapit ... ..	22.5	56.9	25.3		
Mukah ... ..	24.2	11.8	22.5		
4th Division:					
Bintulu ... ..	37.9	64.8	41.1	40.6	+9,200
Miri ... ..	53.6	41.4	46.7		
Baram ... ..	32.9	26.6	32.2		
5th Division:					
Limbang ... ..	18.9	118.4	28.3	26.7	-1,300
Lawas ... ..	26.6	28.5	24.8		
All of Sarawak ...	32.5	28.3	31.1	31.1	

### 2.2.4 Potential Migrant Groups

Growth of population and pressure on land for shifting cultivation are probably the most important reasons for the migratory trends mentioned in the previous sub-section. But they do not explain why the Ibans of the Second and Third Divisions migrate long distances, whereas the Land Dayaks move only short distances, and why they, in order to stay near their homes in the First Division, are willing to endure poverty; or why Malay sedentary farmers and fishermen of the First Division in the face of growing pressure of population, do not appear to migrate. By contrast, the Melanau of the Third Division, who at

the present time suffer varying degrees of poverty are willing to migrate, though as yet only in small numbers. The overall growth in the size of the Chinese population does not account for their movement out of rural districts into towns. In all these cases factors other than population pressures would seem to be involved.

A combination of land shortage in the Iban areas of the Second Division and a series of poor harvests in the Third Division have doubtless accelerated a long established trend for migration among the Ibans which grew in importance during the disorders that accompanied the Confrontation of Malaysia and the Indonesian Republic ten years ago.

The total populations and the ethnic distribution of the communities from which settlers may be recruited are set out in Table 2.2, and in Table 2.3 the division between urban and rural dwellers is shown for those communities on which information has been available.

**TABLE 2.2 DISTRIBUTION OF MAJOR ETHNIC GROUPS IN THE POPULATION OF SARAWAK (CENSUS 1970)**

	Malay	Melanau	Kedayan	Iban	Land Dayak	Kayan	Kenyah	Chinese	Total
First Division ...	99,990	427	20	27,727	81,263	36	43	129,961	346,973
Second Division ...	36,347	102	2	84,623	325	6	3	15,258	137,260
Third Division ...	16,288	44,802	24	138,356	953	3,561	2,848	109,440	319,036
Fourth Division ...	17,371	7,837	4,641	47,544	645	7,721	7,005	34,230	135,918
Fifth Division ...	12,713	66	2,809	4,734	90	23	33	5,131	36,731
Sarawak Total ...	182,709	53,234	7,496	302,984	83,276	11,347	9,932	294,020	975,918

**TABLE 2.3 MAJOR ETHNIC GROUPS IN THE URBAN AND RURAL POPULATION OF SARAWAK (CENSUS 1970)**

	Malay	Melanau	Iban	Land Dayak	Chinese
Urban ...	47,895	6,229	11,921	3,041	130,238
Rural ...	134,814	46,005	291,063	80,235	163,784
Sarawak Total ...	182,709	53,234	302,984	83,276	294,020

### 2.2.5 Conclusions

The majority of the participants in the development of the Study Area can be expected from the Malays, Ibans and Chinese because of their greater numbers, their already wide distribution and, as far as the Ibans and Chinese are concerned, their greater willingness to migrate. Unless special recruitment efforts are made in the First Division most participants are likely to come from the Third, Fifth and Second Divisions.

The Chinese would most easily migrate when reasonable opportunities for their organising and self-help abilities are provided. For the Malays and, more particularly, the other indigenous groups, who are more reluctant—and at present sometimes unwilling—to migrate, it is essential, even under new conditions, to preserve their cultural identity and to provide security based on the use of an

identifiable piece of land, which they can pass on to their successors. In addition there is the need to guide and assist them to adjust to the new environment. These needs have been provided for in the agricultural parts of the Plan (see Chapter 3) by the integration of estate-type development and smallholder farming. Provision is also made for the allocation to private enterprise of areas which are integral parts of the whole development and could be worked as small or medium sized farms or as large estates. This form of development would probably appeal mainly to Chinese settlers at the beginning.

Sociological aspects associated with the different backgrounds and modes of production of the various ethnic groups have been considered when designing the plans for recruitment of suitable migrants (as explained in Chapter 9) and in the proposals concerning the structure of new towns and villages (as explained in Chapter 6).

## 2.3 SETTLER RECRUITMENT AND SELECTION

Recruitment for current land development schemes operates with a minimum of publicity. Potential candidates normally learn of schemes through District or local Administrative Officers, Labour Department staff, local political leaders, or from the radio or through the reports of friends or relatives; and applications are generally forwarded by a local Government Officer to the particular authority undertaking the development.

The success achieved by this or any other future system depends on publicity and communication. In this respect the present selection system has two serious defects:

- (a) it fails to tap the potential settler population effectively; and
- (b) it does not supply sufficient information for potential candidates to make a well-reasoned decision as to whether to join a scheme or not.

As long as these conditions remain, many potential settlers are likely never to hear of scheme openings or, if they do, they may receive an inadequate or inaccurate view of what schemes are like and how to go about making application. Screening procedure may be difficult to apply in these circumstances and those who are selected may come to the scheme expecting conditions very different from what in fact they find. As a result the people become disillusioned and often leave the scheme. These defects are likely to remain until a State-wide organisation for recruitment and selection is created and fully operating.

Recommendations for setting up an organised recruiting and selection system for potential participants to development schemes of all types are given in Chapter 9.

## 2.4 DEVELOPMENT OF THE LABOUR FORCE

Successful development will depend largely on the quality and output of the labour force. Special arrangements will be necessary for educating and training that force. A general description of the manpower requirements has been given in Volume I, Chapter 2.

### 2.4.1 Manpower Training

The creation of an adequately trained and skilled labour force, whether manual, technical or managerial, is a complex matter involving social and cultural habits, as well as proper education and training.

The type and orientation of education in primary and secondary schools can be made of fundamental importance to the student's future ability to master a job, and it is suggested that the traditional curriculum should be continually revised so that students are prepared for the conditions and way of life in the areas where they will work.

Proper vocational training can be undertaken in different ways. Highly skilled workers covering a wide range of subjects can be developed through a combination of practical training in factories or workshops and courses in vocational schools. But many modern industrialised processes can also be learned from specialised training and instruction given over a short period. It is possible to arrange for partially trained persons to be employed and then, through a well arranged series of short-term 'modular' courses, their skill—and accordingly income—can be progressively increased. It is easier to train a person who is already motivated for a particular job than one who is unacquainted with it.

The Department of Manpower Training in Kuala Lumpur is well aware of these possibilities and is planning an expansion of its work to cope with all the new demands arising from the general industrialisation of Malaysia. It is recommended that Sarawak, through its Manpower Section, takes advantage of this situation to begin building-up the necessary training centres in addition to, or in connection with, the vocational school which Government is planning to build in Miri. In particular it is recommended that Government, through the Public Works Department and private contractors, arranges training courses as soon as possible for construction and building workers. Otherwise the artisans will be in short supply for the accelerated development planned to take place from 1975. It is also recommended that training of local artisans should be done during the construction of the Liquefied Natural Gas Plant at Tanjung Kidurong and arrangements should be made in advance with the company concerned.

(a) Other recommendations concerning manpower training are:

- (a) Industrial Training Centres and Vocational Schools should be established after a very thorough study of the kind of skills needed in Sarawak. This approach has already been provided for by Government through the newly commenced Manpower Survey.
- (b) Particular attention should be given to the endeavours of the Federal Training Service to initiate a programme for studying the actual skill requirements of Malaysian industry and to investigate the optimum length of training for various trade skills to ensure that training time is reduced to the absolute minimum compatible with the requirements of the industries.
- (c) Modular Courses should be introduced as soon as possible, using where practical the already existing facilities, such as schools, public and private workshops, depots and building sites for instruction.
- (d) New investors, whether domestic or foreign, should be induced to co-operate on training programmes.
- (e) Wood and timber processing courses should be established in Bintulu in association with the development of the new timber complexes.
- (f) By instigating various types of public acknowledgement for instance the issue of certificates or badges, for different levels of skill attained. Prestige should be given to people qualifying themselves for carrying out skilled work in agriculture, industry, and commerce.

- (g) Adult Vocational Training should be available for workers who want to further qualify themselves. Correspondence courses should be developed in all suitable fields.

It will be necessary for government to:

- prepare the necessary sites in and around towns for training facilities;
- keep close surveillance on all future major developments so that adequate organised training can be undertaken ahead of commencement of operations;
- co-operate closely with the Training Service of the Federal manpower authorities to ensure their assistance and co-operation.

## CHAPTER 3

### AGRICULTURE

#### 3.1 INTRODUCTION

The main characteristics of present agriculture have been described in Chapter 1 and the distribution shown in Figure 1.2. They can be summarised as follows:

- (a) Extensive river based shifting cultivation of hill rice by the longhouse communities who also have small scattered plots of rubber which are generally poorly maintained and only tapped when rubber prices are high.
- (b) Less extensive, settled agriculture around small townships, of the Malays, Melanaus and Chinese cultivating mainly rice, pepper, vegetables and rubber.
- (c) Predominantly smallholder farming.
- (d) Almost complete absence of any form of on-the-farm transport or mechanical aids.
- (e) Recently started large-scale estate-type planting of oil palms in the Lambir-Subis Development Area.

Much of the land in the Study Area is extremely steep and dissected, and liable to severe erosion, other parts consist of peat swamps and yet others are subject to unpredictable flooding. Within the approximate 600,000 acres identified at the broad transect level of survey as having high proportions suitable for agriculture some 100,000 acres were investigated at the semi-detailed soil survey level. The objective was to identify about 50,000 acres for development by 1980. Criteria for selection of the land were:

- that most of it was at present unoccupied;
- that good road connections to Miri or Bintulu already existed or could easily be created;
- that harvesting of the forest on the land was under way or completed;
- that new development on the land could be associated with development already undertaken.

The main determinants of land quality and its suitability for cropping were soil quality and depth, land slope and liability to flooding. Details of the land classification are given in Supporting Report 1.

#### 3.2 EVALUATION OF OPPORTUNITIES FOR AGRICULTURAL DEVELOPMENT

##### 3.2.1 Objectives of Development

The Second Malaysia Plan (1971-1975) (SMP) sets the aims and objectives of development throughout Malaysia, and the specific aspects which are associated with agriculture are:

- to improve the farmers livelihood and the rural amenities;
- to provide employment for the population of working age;
- to diversify agricultural production.

These objectives apply to agricultural development in the Study Area. An additional particular objective specified in the Scope of Work for this Study is that the Government wishes to develop the potential of the Area in order to provide employment opportunities within it primarily for migrants from certain parts of Sarawak where the rural people are unable to make a reasonable livelihood from their land.

In accordance with these objectives the agricultural plan for the Study Area has been specifically aimed at:

- (a) Providing farmers and farm workers with a minimum annual net income of between \$2,500 and \$3,000 a year.
- (b) Opening-up presently unoccupied suitable land to provide employment and farming opportunities for people from outside the Area.
- (c) Providing opportunities for the existing population to participate in and benefit from the development.
- (d) Diversifying agriculture away from the predominance in the Area of rubber and pepper.

### 3.2.2 The Factors Affecting Selection of Enterprises for Development

The factors considered in the selection of enterprises for inclusion in the agricultural plan were:

Environmental—climate, terrain and soil.

Social—traditional enterprises and enterprises needed for social wellbeing.

Technical—the level of knowledge in the State for husbandry and technology for the enterprises.

Economic—production costs and market potentials.

The screening process of all possible enterprises, which generally followed consideration of the different factors in the above order, is outlined below.

#### (a) Climatic Factors

The rainfall is high and often excessively heavy. There is no marked dry season. The erosion hazards, even in the areas selected for agricultural development, impose a severe limitation on the selection of land and crops for development.

Except in valley bottoms, subject to flooding, where rice will be the most suitable crop, agricultural development must depend largely upon perennial and semi-perennial crops. The large-scale planting of annual crops is limited on two particular counts:

- (i) the need for yearly ploughing and preparation of land for planting is incompatible with the terrain and climatic factors;
- (ii) most annual plants require a distinct, predictable dry season for ripening and harvesting of their crop.

### **(b) Terrain and Soil Factors**

There are few large contiguous areas of land with uniform cropping capabilities. Rapid changes of land capability within short distances result in numerous irregularly shaped and sized patches each with different agricultural capabilities. This is clearly shown on the land capability maps in the Map Folder.

The soil on sloping land is susceptible to erosion by surface run-off and by soil creep even under undisturbed forest; material is constantly moving down the slope, accumulating on the river flood plains or passing beyond them to the sea. Although the climate favours rapid rock weathering the consequence of erosion is that the soils on the hill slopes are often shallow and, combined with their slope, are only suitable for a limited range of crops most of which are trees. The high rainfall leaches the soils of much of their nutrient contents, and the soils are of low fertility. Sustained cropping will require the use of fertilizers.

The removal of the natural vegetation will accelerate the processes of leaching and erosion, and will require conservation measures on all but the gentlest slopes. Such measures will add considerably to the cost of development and the difficulties of management. The valleys where soil material is accumulating are without erosion hazards but they are often subject to river flooding, which is virtually uncontrollable in many places.

The constraints indicated above confined the search for development activities largely to perennial and semi-perennial crops. The enterprises considered included sago, tree fruits, tree spices, coconuts, pasture for cattle, annatto, coffee, oil palms, rubber, low-land tea, pepper, cashew nuts, sugar cane, some essential oil crops and tapioca. The annual crops considered (but only for relatively small-scale planting) were swamp rice, groundnuts, vegetables, pulses, root crops, maize, sorghum and several spices. Livestock enterprises considered were cattle, pigs, poultry and goats, also the pond culture of fish, crustacea and turtles.

### **(c) Social Factors**

The staple food of all races in Sarawak is rice. Therefore, rice would naturally receive a high priority in the enterprises considered for inclusion in the development plan. However, there are two additional aspects which insure inclusion of this crop in future development plans:

- (i) amongst numerically important communities in Sarawak cultivation of rice is of religious significance;
- (ii) following recent shortages of rice in south-east Asia the Sarawak Government has declared a policy aimed at making Sarawak self-sufficient in rice, or even to become an exporter of the commodity.

### **(d) Economic and Technical Factors**

Possible enterprises were further grouped according to their commercial production potential, accessibility of the land areas selected and the effect of transport problems encountered in the Study Area. The groupings are shown in Tables 3.1 and 3.2. For some enterprises, their placing into a specific group was not a clear-cut decision. There are border-line cases which are indicated in the notes to the tables.

This preliminary screening was followed by economic evaluations of the more promising enterprises. The details of these studies are given in Supporting Report 2, Part IV for crops and in Part V for livestock and fisheries. The results are summarised in Table 3.3. The bases on which the analyses were made were as follows:

- (i) Commercial rate of return over 25 years for which all inputs and outputs were included at their projected market values which are given in paragraph (e) below dealing with market factors.
- (ii) Internal rate of return over 25 years for which social prices were attributed to inputs and output. For other calculations labour was valued at the shadow wage rate of \$3 per day and all taxes and duties were excluded from the cost of inputs or the value of output.
- (iii) Returns to labour were calculated as the annual equivalent of returns to labour at the social rate of discount (ten per cent) divided by the annual equivalent labour requirement in man-days.
- (iv) Returns to land were calculated as the net present value of output net of all factors, including capital, at social prices reduced to an annual equivalent per acre.
- (v) Employment generated at maturity was measured in terms of the full-time jobs created per hundred acres.
- (vi) Employment generated at maturity was measured in terms of full-time jobs created per thousand dollars capital invested.

#### (e) Market Factors

Comprehensive market studies were undertaken only of those enterprises which were shown to be definitely suitable for inclusion in the development plan by the screening process indicated. The objectives of the market analyses were to estimate the extent to which the selected enterprises could be developed in the Study Area, the orientation that the development should have, and the likely trend of future prices. These studies are given in detail in Supporting Report 2, Parts IV and V, and are summarised below.

#### Oil Palms

At present the world demand for palm oil exceeds supply and prices are high. However, the future market for palm oil and palm kernels has to be viewed in the context of the overall world market for all vegetable and animal fats and oils.

The long-term predictions for this market are complex due to the wide range of competing products as well as technical, natural, economic and political factors which may favour or operate against particular products. Over the whole range the increasing possibilities for substitution between the various oils, in conjunction with economic factors, make it likely that there will be a decrease in price differences between particular types of oils and fats.

The Food and Agricultural Organisation's Indicative World Plan shows that if Malaysia were to plant an average of 30,000 acres of oil palms per year during the period 1970 to 1975 and 35,000 to 50,000 acres per year between 1975 and 1985 then the Federation's production would be at least 1.5 mn tons in 1985. These are targets likely to be equalled or exceeded by Malaysia as a whole, and production would amount to about 40 per cent of projected world palm oil

TABLE 3.1. GROUPING OF POTENTIAL AGRICULTURAL ENTERPRISES ACCORDING TO COMMERCIAL POTENTIALITY

Group Description	Enterprise
<p><i>Group I</i></p> <p>Enterprises known to be commercially viable for immediate development on a large scale.</p>	<p>Rubber, oil palms.</p>
<p><i>Group II</i></p> <p>Enterprises known to be commercially viable and suitable for immediate development but on a restricted scale or only for local market.</p>	<p>Maize for green cobs; swamp rice (single crop); vegetables for fresh markets; annatto, essential oils (lemon grass, patchouli), pepper, coffee*, cocoa, coconuts, tropical fruits for fresh markets, sago, beef breeding and fattening for fresh meat*, pigs for fresh meat, poultry (eggs, broilers and hatching eggs), aquaculture (fish and fresh water prawns).</p>
<p><i>Group III</i></p> <p>Enterprises with promising commercial prospects but requiring an initial period of trial or limited research prior to recommendation for development on a large scale.</p>	<p>Dried chillies, swamp rice (double cropping), tapioca for chips or feed, cashew nuts*, essential oils (citronella and vetiver grass), grasses and legumes for grazing or cutting (beef production), spices (cardamom, turmeric, cloves, nutmegs), lowland tea, aquaculture (brackish water crustacea, turtles).</p>
<p><i>Group IV</i></p> <p>Enterprises possibly suited to local environment but requiring considerable research and field trial before they might be considered for commercial planting.</p>	<p>Legumes (beans, groundnuts, cowpea, soya beans, etc.), maize and sorghum for grain, bananas for export, papaya for papain, spices (vanilla, ginger, cassia, cinnamon), sugar cane (unrefined sugar), fruits for processing, sago (cultivated plantation).</p>

\* Enterprises which are border-line between the group in which they are shown and the group which follows.

TABLE 3.2 GROUPING OF POTENTIAL AGRICULTURAL ENTERPRISES ACCORDING TO ACCESSIBILITY AND TRANSPORT FACTORS

Group Description	Enterprise
<p><i>Group I</i></p> <p>Enterprises whose inputs and end-products would be easily transported and for which no special processing facilities would be envisaged. These activities were regarded as suitable for development in remote areas served by minor waterways or tracks.</p>	<p>Dried chillies, swamp rice (single crop)*, annatto, coffee (robusta), spice (cardamom), cashew nuts.</p>
<p><i>Group II</i></p> <p>Enterprises whose input requirements are high and whose end-products would be bulky but reasonably durable or could be processed on the farm, requiring simple means of transport on large rivers or rural roads. These activities were considered suitable for semi-remote areas.</p>	<p>Legumes (beans, groundnuts, cowpeas, soya beans, etc.), maize and sorghum for grain, papaya for papain, pepper, spices (turmeric, vanilla, ginger, cassia, cinnamon, cloves, nutmeg), sugar cane (unrefined sugar), cocoa, coconuts (copra), rubber.</p>
<p><i>Group III</i></p> <p>Enterprises which due to the bulkiness or perishability of their product or need for specialised large-scale processing of their products require good roads or waterways. These activities were considered suitable only where proximity to an all weather road network, navigable waterways, processing plant or urban market was satisfied.</p>	<p>Maize for green cobs, swamp rice (double cropping), tapioca for chips, vegetables for fresh market, fruits for fresh market or processing, essential oil crops, grasses and legumes for grazing or cutting (i.e. beef cattle rearing), oil palms, sago, tea (low-land), pigs for market, poultry for market, aquaculture schemes.</p>

\* Cropping for home consumption only. If rice is grown for market it should be considered only in Group III.

TABLE 3.3 ECONOMIC ACHIEVEMENTS OF SELECTED AGRICULTURAL ACTIVITIES

ACTIVITY	Returns to Resources			Internal Rate of Return (Social Prices) per cent	Employment Generated		Investment Required	
	Labour \$/man day	Land \$ per acre/annum	Full time Workers per 100 acres at Maturity		Cumulative Undiscounted Deficit Cash Flows \$ per acre	Cumulative Deficit Cash Flow Including Interest at 7 per cent \$ per acre		
							Commercial Rate of Return (Market Prices) per cent	
<b>Oil Palm</b>								
Estate based on 60 ton per hour mill	14.1	148	6.5	23	1,356	1,713		
Smallholder farmer	10.0	155	6.7	23	1,147	1,430		
<b>Rubber</b>								
Estate based on 10 ton per day factory:								
Large lumps field material } without stimulation	2.3	Negative	18.6	9	2,213	3,291		
Latex field material } with stimulation	3.6	20	18.1	11	2,195	3,056		
Latex field material with stimulation	4.2	45	21.1	12	2,201	3,063		
Smallholder delivering to central factory:								
Large lumps material } without stimulation	3.3	11	18.1	11	1,650	2,492		
Latex field material } with stimulation	4.5	44	17.7	14	1,635	2,331		
<b>Pepper</b>								
Smallholder farmer:								
Average yield situation	7.6	925	82.5	38	4,127	4,666		
Low yield situation	5.6	463	73.7	26	4,127	4,666		
<b>Cocoa</b>								
Smallholder farmer	9.6	201	9.3	25	1,167	1,450		
<b>Rice</b>								
Smallholder farmer	3.7	35	15.4	14	1,098	1,316		
<b>Beef</b>								
Ranch (5,000 acres)								
Initial breeding scheme	11.0	40	1.1	12	1,630	2,202		
Expansion scheme	10.1	35	1.1	13	1,062	1,434		
Smallholder farmer growing-out steers	9.6	46	2.1	15	559	717		
<b>Aquaculture schemes: smallholder farmer</b>								
1 acre Chinese carp	33.2	1,795	18.0	> 50	4,431	4,741		
1/3 acre Chinese carp	17.8	1,182	24.0	45	4,380	4,686		
1/10 acre Local fish	9.6	792	24.0	31	3,710	3,970		
1/3 acre prawns and local fish	18.0	1,151	24.0	39	4,310	4,612		
Turtles (1/10 acre)	5.0	869	140.0	37	4,327	4,864		

production of 3.7 to 4.0 mn tons by 1985. This total world output represents a growth rate of 5.5 per cent per annum over the period 1970 to 1985. The predicted growth in demand for fats and oils is about 3.5 per cent per annum. Thus by 1985 supplies are likely to outstrip demand and result in a predicted gradual decline in the price for oil palm products.

Within the overall Malaysian planting programme it is considered that up to 155,000 acres could be planted in the Study Area by 1990 without noticeably prejudicing the projected world market situation.

The projected prices of palm oil and palm kernels over the next 20 years are as follows:

Year	Price per ton f o b Sarawak	
	Palm Oil	Palm Kernels
1975	520	365
1980	422	315
1985	398	290
1990	398	290
1995	398	290

### Rubber

In the last decade the world market prospects for natural rubber have been overshadowed by competition from synthetic rubber. However, the very recent change in the marketing of crude oil supplies and the unprecedented increase in its price are reasons to adopt a more optimistic view with regard to demand for natural rubber. The present position is one where demand is greater than supply and prices are higher than for many years.

Since the increases in the price of crude oil considerable uncertainty has been attached to the FAO Indicative World Plan predictions which suggested that natural rubber might command 24 per cent of the elastomer market by 1985. Under the present changed conditions the market share of natural rubber could increase or decrease depending on a number of factors of which the more important are:

- the demand for oil supplies for other uses combined with high crude oil prices; this could induce caution in the rate of investment in synthetic rubber installations and act favourably for increased demand for natural rubber;
- increased refined fuel oil prices; this could cause a decline in the demand for vehicle tyres and therefore a drop in demand for natural rubber;
- improved primary processing techniques for natural rubber aimed at specialised forms catering for specific user needs; this could accelerate the expansion of uses for natural rubber.

A range of figures considered reasonable for natural rubber's share of the world market by 1985 is as follows:

Market share of natural rubber (per cent)	Equivalent quantity demand on world market (mn tons)
High 32	5.95
Low 17	3.13
Average 24	4.45

These estimates, compared to present demand for natural rubber (about 2.4 mn tons), show that there should be an increased demand for it if it is available at a competitive price.

Projections of future production are extremely difficult to make because production has been so affected by changing prices. For this reason existing statistics are unreliable in gauging future production, but a review by the Rubber Research Institute of Malaysia (1970) estimated Malaysian production would reach 2.1 mn tons by 1980. In addition the widespread use of ethylene based stimulants could increase the figure by 100,000 tons. Continuing these possible production growths to 1985, Malaysian output might reach 2.6 to 2.8 mn tons, or about 60 per cent of world usage projected by FAO.

From available information it appears that the period from 1980 onwards will be a critical time for natural rubber on the world market. By then supplies from Malaysia are likely to have built-up and similar increases can be expected from other major producing countries. Therefore, some degree of caution is recommended in rubber planting plans aimed at filling the present shortfall in supplies. Future production should be orientated to provide high yields and an ensured supply of a uniform, good quality product. New and replacement plantings totalling about 90,000 acres by 1990 would appear a reasonable target for the Study Area. An important respect in this connection is that any new planting of rubber trees will not come into production for seven years by which time market conditions may have changed again.

In view of the uncertainty of the rubber market situation a basic price of 57 cents per pound f o b Singapore was used in calculating the returns to rubber. This price would be equivalent to 47 cents per pound f o b Sarawak. For a sensitivity analysis a price 20 per cent higher was used.

### **Cocoa**

During the period from the late 1950's to the mid-1960's cocoa production increased more rapidly than demand with the result that prices declined considerably by the mid-1960's. Since then production has increased slowly with virtually no changes over the past three years and prices have generally recovered, indicating that a balance is being reached between supply and demand. But a general feature of the cocoa market is its price instability with rapid changes from month to month and year to year. This has led to the present concerted efforts by major producers and consumers to negotiate an International Cocoa Agreement. Although reactions to this have been favourable final ratification has yet to be achieved.

The FAO commodity projections (1967 and 1971) suggest that supply and demand would be more or less in balance by 1985. However, if the potential which exists for increasing production in a number of countries is utilised there could be an overproduction by that time. Also past experience indicates that due to the relatively low price elasticity of demand in the main importing countries any tendency towards continuously high prices could result in curtailed consumption. Conversely, consumption is stimulated by periods of low prices and, in general, consumption is rising in developing countries at a faster rate than in the traditional consuming countries of the United States and Western Europe (4.0 per cent per annum compared to 3.5 per cent). For example, chocolate is already manufactured in Peninsular Malaysia providing a ready market for the good quality cocoa produced in Sabah. Another encouraging feature of the cocoa

market in recent years has been the increase in Soviet Union imports and this country was ranked third of world importers in 1971.

The conclusion of the market analysis was that the production from up to about 6,000 acres of cocoa in the Study Area by 1990 could be safely absorbed. Production should at first be aimed at the export of a high standard quality of dried beans. Sophisticated processing should not be undertaken but the manufacture of cocoa butter and powder could possibly be undertaken in Sarawak when local production of dried beans has reached sufficient quantities.

The prices forecast which has been used in the economic evaluations were as follows:

<i>Year</i>	<i>U.S. Future Price U.S. (\$) per lb.</i>	<i>Job Price Sarawak Malaysian (\$) per lb.</i>
1975	31	60
1980	29	55
1985	27	50
1990	27	50
1995	27	50

### **Pepper**

A feature of the world pepper trade is that production occurs only in a limited number of countries from which it is exported throughout the world. Variations in supply tend to cause fluctuating prices and contribute to competition between the exporting countries. Also the demand for pepper is very inelastic, thus prices respond to any change in the supply situation and wide fluctuations have tended to occur in the past. International measures to derive a buffer-stock operation to reduce price fluctuations are currently being examined but little progress has been made so far in the face of upward price trends.

Most pepper is consumed in its raw state, and in the producing countries little progress has been made up to now in discovering new uses or developing processing facilities. However, in the world market there is considerable increase in the use of oleoresin extraction of piperine from black pepper.

At present Sarawak pepper is mainly sold through brokers and agents in Singapore who provide credit, storage, clearing, grading and packing facilities as well as contact with overseas buyers. Marketing channels are, however, currently under review and a Pepper Marketing Board, aimed at promoting direct sales to consuming countries and securing a larger share of the world market for the Malaysian product, was established in 1973. The intention is to introduce a compulsory grading of all pepper exported from Sarawak. This will offer an opportunity (of which the Director of the Pepper Marketing Board is fully aware) for Sarawak to sell a grade of light berries directly to the oleoresin extraction firms thus gaining an opening in this expanding market.

Over the period 1968 to 1970 Sarawak on average accounted for 20 per cent of world exports. The world demand for pepper is projected to increase at the rate of two per cent per year (FAO, 1970). Sarawak's possible share of this demand is shown below on the basis of two assumptions—either retaining a

constant share, or obtaining an increasing share of one per cent of the annual increase per year.

Year	Sarawak's Share				
	World Demand Assuming a 2 per cent Annual Increase	Assuming Constant Share		Assuming Share Increases	
	(Thousand tons)	Quantity (Thousand tons)	% of World Demand	Quantity (Thousand tons)	% of World Demand
1970	85.0	24.5	29	24.5	29
1975	93.8	27.2	29	27.6	29.5
1980	103.6	30.0	29	32.0	31
1985	114.4	33.2	29	37.9	33
1990	126.3	36.6	29	45.7	36

The figures show that there are opportunities for increasing production of pepper in Sarawak and it is recommended that the crop is included in the cropping pattern for the Study Area. It should be considered an important supplementary crop to be grown by most farmers.

The prices used in the economic evaluations were the 1964 averages:

\$125 per picul for white pepper

\$100 per picul for black pepper

## Rice

Sarawak is an importer of rice. Overall consumption in the State has increased with population growth and local production has generally kept pace with, but has not equalled, the increased demand. Thus while imports have been necessary to supply total demand, the proportion of imports has tended to fall over the last decade from around 50 per cent in the early 1960's to under 40 per cent in the early 1970's. The most significant contribution to increasing local supplies is attributed to swamp rice production which has grown by about 70 per cent over the last decade. Overall production increased by 50 per cent over the same period.

Available statistics indicate that total local consumption of rice rose from about 120,000 tons in 1961 to about 159,000 tons in 1971. The per capita consumption has however shown no specific trend, averaging around 340 pounds of milled rice equivalent per year in Sarawak as a whole to 310 pounds in the Study Area. In poor crop years subsistence farmers go short of rice; imports do not balance the deficit because farmers in remote areas do not usually buy additional supplies in the market. Thus demand for rice in Sarawak is largely a function of population growth and, to a much lesser extent, income changes. For the purpose of projecting possible future local demand for rice the population of Sarawak has been assumed to grow at 2.8 per cent per annum, and per capita income at three per cent per annum. The income elasticity of demand for rice at that income growth rate is likely to be zero or negative (i.e. -0.2). On the

basis of these assumptions two possible levels of per capita consumption of rice over the next 20 years have been calculated as shown below.

<i>Year</i>	<i>Average annual consumption per capita at two demand levels of income elasticity</i>	
	<i>A</i>	<i>B</i>
	0	-0.2
	lb.	lb.
Basic level	340	340
1975	340	330
1980	340	320
1985	340	310
1990	340	301

Using these consumption figures the following estimated future demands were calculated.

<i>Year</i>	<i>Population '000</i>	<i>Projected Demand at per capita level 'A' ('000 tons rice)</i>	<i>Projected Demand at per capita level 'B' ('000 tons rice)</i>
1975	1,120.5	170.1	165.1
1980	1,286.3	195.2	183.8
1985	1,476.8	224.2	204.4
1990	1,695.5	257.4	227.8

Possible future rice production in Sarawak up to 1990 is shown in Table 3.4 and has been calculated on the following assumptions:

- the total area of swamp rice would increase on average by 3,400 acres per annum or about 52,000 acres over the 20 year period;
- the total area of hill rice would remain static at about 186,000 acres;
- average yields of swamp rice would increase to 2,265 pounds padi by 1990 while hill rice yields would remain static at 640 pounds padi per acre.

On the basis of these estimates local production would be unlikely to supply the total Sarawak demand for rice by 1990, but the country would be 74 per cent self-sufficient.

Two alternative possibilities were examined for the 1990 situation:

**Alternative I:** assumes there would be a slight increase in the area under hill rice, and yields would increase to 2,750 and 800 pounds padi per acre for swamp and hill rice respectively. Under these assumptions the country would still not be self-sufficient.

**Alternative II:** assumes the area of swamp rice would increase by 6,800 acres per annum, and yields increase to the levels proposed for Alternative I. Total production would then possibly meet local demand.

Calculations similar to those above were carried out for the Study Area but applicable to a population growth of 4.0 per cent per annum which allows for in-migration. Future demand for rice was shown to reach almost 33,600 tons by

1990. It was found that if the yields from existing areas of rice cultivation were to remain at their present levels and there was no increase in the area under hill rice then to supply the demand would require the opening up of about 37,600 acres of new swamp rice land assuming present yields. But if yields on the new areas was 2,750 pounds per acre then roughly 22,000 new acres of swamp rice would suffice. If yields on existing swamp rice areas also increased to the higher level then only about 15,000 acres of new swamp rice land would be required.

TABLE 3.4 PROJECTED SARAWAK RICE PRODUCTION 1975-1990

Year	Acreages			Yields of Padi		Total Production				
	Swamp Rice	Hill Rice	Total	Swamp Rice	Hill Rice	Swamp(I) Rice	Hill(I) Rice	Total		
	Thousand acres			lbs per acre		Thousand tons rice				
1975	...	...	158	186	344	1,625	640	72.2	36.1	108.3
1980	...	...	175	186	361	1,840	640	90.6	36.1	126.7
1985	...	...	192	186	378	2,052	640	110.8	36.1	146.9
1990	...	...	209	186	395	2,265	640	133.1	36.1	169.2
1990 Alternative I	...	...	209	200	409	2,750	800	161.6	48.6	210.2
1990 Alternative II	...	...	260	186	446	2,750	800	201.1	48.6	249.7

NOTE (1) Conversion rates of padi to milled rice equivalent were on the following basis:

Swamp rice, 63 per cent.

Hill rice 68 per cent.

These calculations show that, to meet the Government's target of at least self-sufficiency in rice, the development programme for the Study Area must include the opening up of sufficient new swamp land to supply the local population. This must be a minimum target.

The price for rice used in the economic calculation, was a farm-gate value of \$317 per ton of padi.

### Beef

Livestock production is of limited importance in Sarawak at present. Domestic production of pigs and poultry adequately supply the demand for these products. However, there has been no apparent change in the population of cattle and buffaloes over the past decade and about \$1.3 mn worth of beef is currently being imported either as live animals for slaughter or as frozen meat. There is thus an established local market for beef. On a worldwide basis FAO predictions indicate that future demands are likely to exceed supplies. This situation will undoubtedly lead to a hardening of beef prices and would enable a local beef industry to enter export markets.

The possible effect in Sarawak of an increase in local supplies of beef would be a decrease in retail prices which, if brought to the levels prevailing in Peninsular Malaysia of \$1.6 per pound, would increase annual consumption from the present 1.33 pounds per capita to about 4.3 pounds. Future rises in living standards would increase this consumption rate to about 9.0 pounds by 1995. Using these assumptions, projections of quantities of beef, carcasses and animals required in Sarawak are given in Table 3.5.

TABLE 3.5 PROJECTED BEEF CONSUMPTION IN SARAWAK 1975-1995  
AT PRICES EQUIVALENT TO THOSE IN PENINSULAR  
MALAYSIA

Year	Beef Consumption		Equivalent Number of Carcasses at 400 lb. each	Equivalent Number of Animals required in the National Herd
	Per Capita lb.	Total ('000 lb.)		
1975	5.0	5,480	13,700	63,125
1980	5.8	7,192	17,940	89,875
1985	6.7	9,400	23,500	117,500
1990	7.8	12,386	37,212	150,500
1995	9.0	16,164	40,412	208,250

The main external markets to which Sarawak beef might be exported are Hong Kong, Japan, Brunei and Singapore. All these are already supplied with live animals and/or meat by large-scale, well established organisations in Australia, New Zealand, China, Thailand and Indonesia. To compete with these traditional suppliers will require efficient production methods and high veterinary standards. On the other hand demand in the potential markets will rise considerably. For example, the Singapore market is currently estimated to require 12,000 live animals and seven million pounds of frozen beef annually, and by 1990 demand, even at a conservative growth rate, is expected to treble. So there should be ample scope for Sarawak to enter the export trade. But initial developments in Sarawak should aim at supplying the local market. When this has been achieved the first exports should be live animals because the production of chilled or frozen meat will require costly slaughterhouse and refrigeration plant, which would not be worth establishing for an export of less than 25,000 head per annum.

The prices used in the economic evaluation were:

- for weaners and steers, between 50 and 60 cents per lb. liveweight;
- breeding heifers were valued in relation to future production potential assessed on the basis of seven calves, worth \$540 each, produced over eight years;
- for cull cows \$450 each.

#### Freshwater Fish and Prawns

Fish is by far the greatest source of protein in the human diet in Sarawak and production of pond cultured fish should be aimed, for the foreseeable future, at satisfying local demand. The market for freshwater fish is in two main categories:

- (i) rural domestic demand for fresh fish, mainly smaller sized and locally bred;
- (ii) the speciality urban fish market linked to the restaurant and special occasion (such as Chinese New Year) trade.

Probably the greatest need is in the rural areas where the supply of fresh fish from marine sources is usually not available. Freshwater culture of fish in these areas will be appropriate because most rural people are already familiar with freshwater fish and there is no sales resistance to this commodity.

## Taiwan Turtles

These can be sent to market alive and, provided they are occasionally moistened with water and kept in the shade, they can survive for a number of days out of the pond. Therefore, easily reached markets anywhere in Sarawak can be considered.

There is already a good demand for the local soft-shelled turtle in the Kuching and Sibu restaurants, but generally most of the local turtles are too large for an average family. The Taiwan turtle, which is ideal for market at about two pounds, would have an initial novelty value and would appeal to the housewife.

Once local demand is satisfied the export markets could be exploited. Kuala Lumpur, Singapore, Hong Kong and Japan are all potential markets where the price could be expected to be double that in Sarawak. In Hong Kong and Japan turtles are not only a source of food, but medicine is made from the blood and bile.

## Other Crops

### (i) Robusta Coffee

In Sarawak local production does not satisfy demand. In 1972 imports of coffee, in one form or another, amounted to about \$1.46 mn. Recent market estimates made for Peninsular Malaysia (FAMA, 1973) indicated that there is an immediate market for about 2,500 tons of coffee beans per year.

### (ii) Annatto (*Bixa orellana*)

The seed of this small tree is covered by a red substance which has a value as a colouring agent in foods and cosmetics. World market demand has risen recently due to increased restrictions in the United States, Western Europe and Japan on the use of synthetic colourings. A ready market exists for the dried seeds in Singapore.

### (iii) Cashew Nuts

The export market consists of three products; unshelled cashew nuts, cashew kernels and cashew nut shell liquid. The last product need not be considered at this stage because supply already exceeds demand and future demand is not likely to increase faster than the present large-scale producers could easily match. But the potential markets for unshelled nuts and kernels are good.

India is the main purchaser of unshelled nuts; it imports between 150,000 and 200,000 tons of nuts a year to supply its processing factories which re-export the extracted kernels. However, the present main supply of unshelled nuts (East Africa) is already diminishing as an increasingly large proportion of the crop is diverted to the extraction plants recently introduced into those countries. Despite efforts by India to increase its domestic supply of nuts it seems likely that it will create a strong demand for unshelled nuts in the foreseeable future.

A possible further market for unshelled nuts from Sarawak is Peninsular Malaysia where cashew plantations and processing facilities are being established with Government support.

The market situation for cashew kernels has been extremely favourable over the last ten years. Both demand and prices have followed an upward trend. The prospects for further growth in demand in North America, Western Europe, Japan and Australia are good. It is expected that the market will be able to absorb all presently planned increases.

Thus, from the market point of view the planting of cashew nuts could be confidently undertaken in Sarawak and in the Study Area. Production should at first be aimed at the export of unshelled nuts because a total raw nut production of about 650 tons a year is required before it is worth installing a nut decorticating plant.

#### (iv) Spices

In most cases the aim in planting spice crops would be production for sale to the oleoresin extraction industry.

Prepared oleoresins are the residues isolated by evaporation of solvent extracts of plant material. They are mostly used as food flavouring and colouring and can come from almost any spice or herb.

Prepared oleoresins are normally sold to the food industry in the form of dispersed spice extracts, i.e. spread on a variety of dry sterile bases. In this form the products can be blended easily with other ingredients. The food industry is content to pay premia for the oleoresins which compete commercially with the dry spices because in the form of a dispersed extract it is sold weight for weight equivalent in strength to the dry spice. The advantages are:

- it avoids the high bacterial load carried by most major spices;
- it is standardised in strength and quality to a greater extent than the dry spices.

Dispersed spice extracts have made, and continue to make, a large impact on the industrial market for spices. In the United States they have replaced about 70 per cent of this market, in the United Kingdom about 50 per cent and in Western Europe about 15 per cent, but the percentage is rising.

The prospective demand for oleoresins is, therefore, great and their extraction would appear a profitable business for the major spice producing countries to enter. However, there are many technical and marketing problems which would demand caution in starting such an undertaking. The solution for Sarawak would be to sell the dried spice to an established nearby oleoresin extraction firm, in Singapore for example. The distance to Singapore is not great and freight charges would not be high. An established firm would have the technical know-how and the markets. Reasonably large, regular supplies of a standard dried product would be necessary.

#### Turmeric (*Curcuma longa*)

The present world demand for turmeric for oleoresin extraction is greater than 5,000 tons, which was the 1968 demand. It is used for both colouring and flavouring. For oleoresin extraction the rhizomes, after washing, can be chipped and then sun dried.

#### Ginger (*Zingibes officinale*)

There is a limited local market for undried ginger. For the oleoresin market the growing and preparation of ginger is the same as for turmeric.

#### Sweet and Hot Chillies (*Capsicum spp.*)

This group is the most important for oleoresin extraction. There is a large and expanding market for it. Paprika (*C. annum*) is valued for its flavour and its red colouring but is not likely to be of great promise in the Study

Area because of the difficulty of drying the very fleshy fruits. But the small, very hot chilli *C. minimum* should not present this problem. The drying of locally collected samples presented no problem but evaluation for capsaicin content proved that the local variety is lacking in this ingredient and is not of commercial value. It will be necessary to introduce a sufficiently 'hot' variety. Seed of a commercial variety was obtained and passed to the Department of Agriculture in the Fourth Division. Other seed samples could be obtained from processing firms.

**Nutmeg and Mace (*Myristica fragrans*)**

Nutmeg is the seed of this tree crop and mace the covering which surrounds the shell containing the nutmeg. There is a limited market for these products.

**Cloves (*Eugenia caryophyllata*)**

There is a reasonable market for this crop in the world trade, but an interesting possibility would be to supply Indonesia. Although that country grows cloves itself the oil content of the variety is too high for inclusion in the cigarettes that are so popular there. Indonesia imports large quantities of cloves from Zanzibar for the cigarettes. Cloves of the correct variety, grown in Sarawak, would be in a good geographical position to supply that market.

**Cardamom (*Ellettaria cardamomum*)**

There is a limited but expanding market for this spice.

#### (v) Essential Oil Crops

Generally it is difficult for a new producer to enter the essential oil market which is dominated by well established trading houses who have their traditional suppliers. Also quality standards of the refined oils are extremely stringent. Nevertheless there are possibilities of entering the market for the more widely used, and easily produced oils. The least possible processing should be undertaken locally.

There is a ready market in Singapore for the dried leaves and young stems of patchouli (*Pogostemon cablin*). The harvested material requires merely drying and bailing.

Citronella grass (*Cymbopogon nardus*) and Lemon grass (*C. citratus*) are crops which also produce oils in this category, but there would be need for simple distillation plants if these crops are to be included in the development.

### 3.2.3 Selection of Enterprises

The groupings and studies previously described showed that only two enterprises, oil palms and rubber, could be included in the agricultural plan for immediate large-scale plantings, but beef rearing, cocoa and pepper growing and single cropping of swamp rice were enterprises which could be included on a more limited scale so long as reasonable precautions were taken in selecting the land for them.

Other potentially remunerative activities that could be undertaken on a small scale include the growing of annual grain, pulses and vegetable crops, the planting of tree fruits, several spices, cashew nuts, annatto and some essential oils as well as the rearing of pigs and poultry. The choice and size of the enterprises would often depend upon the distance from an urban market. Pigs and poultry, of which

there is already considerable experience, would have wide appeal, and many kinds of fruit and vegetables for home consumption or sale. Among the more specialised enterprises are spices like turmeric, cardamom and chillies if the production is aimed at the oleoresin market. Also the pond culture of fish, freshwater prawns and Taiwan turtles could be financially rewarding if undertaken near the major towns and would be nutritionally valuable as subsistence enterprises in the more remote areas. Aquaculture enterprises generally give high returns to investment and basic resources but they are very capital intensive and the economic returns are sensitive to pond construction costs.

Oil palm is the most attractive crop for large-scale development in terms of returns to commercial and social investments as well as land and labour resources. It has already been proved to grow well in the Area and considerable technical knowledge is available locally. Plantings totalling about 155,000 acres could be planned in the Study Area without prejudicing the projected market.

The economic studies indicated the importance of large-scale operations particularly with regard to processing. Large capacity mills are needed in order to achieve economies of scale. Unit costs of virtually all production items are generally higher in Sarawak than elsewhere and only by operating efficiently and on a large scale will it be possible to create an industry that would be competitive on the world market. Development in the Study Area should be based on mills with a capacity of up to 60 or 70 tons of fresh fruit bunches per hour corresponding to planted acreages of about 30,000 acres within a radius of about 20 miles of the mill.

Although rubber is not predicted to give economic returns as high as most of the other enterprises it generates a relatively high labour demand and is a desirable enterprise for that reason. Also it has been grown widely in Sarawak for many years and is at present a major export commodity for Sarawak. The rubber market analysis indicates that a development aim should be to maintain Sarawak's position as a rubber producer. A further objective should be to create sufficiently large concentrations of new, high yielding rubber plantations so as to establish a firm base for setting up central processing and marketing facilities which would also handle production from existing rubber plots. This would provide an incentive for better maintenance and more regular tapping of these plots.

Cocoa compares very favourably in all respects with any undertaking, either small or large scale, but it is particularly favourable in terms of returns to investment and land resources. An expansion of this activity on suitable land could be advantageously undertaken. Sufficient experimental evidence exists in Sarawak to warrant a cautious start to creating a cocoa growing industry. On account of the market restraints for cocoa the acreages in the Study Area during the next five years should expand slowly and be kept constantly under review. The potential in the Area appears to be considerably greater than the market analysis indicates could be safely planted. Plantings should initially be restricted to the best agricultural land and should be in fairly large individual blocks in order to facilitate good management and pest control and to enable reasonably large processing facilities to be located centrally. An important production aim should be reasonably large, uniform export consignments of good quality beans.

The future for beef appears promising and beef enterprises should be expanded as soon as techniques are found that are suitable to the local conditions. But local knowledge and experience of cattle rearing and pasture management are

limited, and development should at first be restricted to creating a breeding herd initiated by importing beef-type cattle and keeping them under commercial ranch conditions. The objective should be to establish a foundation herd of beef-type cattle as a basis for a stratified beef industry in Sarawak. The Sarawak Department of Agriculture should support this development with investigations and training. The objective should be the extension of beef cattle farming as widely as possible among the farming community. The breeding ranch could, for example, make young stock available to farmers and smallholders for fattening in addition to the sale of breeding stock to establish other foundation herds. Economically an initial breeding scheme does not compare with other large-scale undertakings but in an expansion scheme beef rearing would be comparable with most alternatives. At first production should be aimed at supplying the local Sarawak market but the ultimate aim would be to enter the export market.

Beef enterprises have a very low capacity for generating new employment. Smallholder growing-out of steers for beef would be relatively attractive, but due to low returns to land the enterprise would require a fairly large undertaking to produce an acceptable level of family income if it is the only enterprise. It appears that beef rearing could be advantageously developed on land with shallow soils which is marginal for other activities or as a supplementary enterprise on small-holdings.

Pepper growing gives good economic returns, but the risk of failure due to disease attack and the high capital investment required combine to make this enterprise an undertaking best suited to relatively small-scale operations. Pepper is seen as an important subsidiary crop for small-scale farmers with, perhaps, organised processing of white pepper at convenient centres. Investigations should be undertaken into ways of increasing Sarawak's share of the market for oleoresin extraction. Market projections indicate that total new plantings in the Study Area should not exceed about 3,500 acres in the near future.

Rice growing does not compare favourably with any other activity except in terms of employment. Its role should be mainly one of satisfying local demand for food, and as such would perform an essential function in the development process. Most of the land suitable for this crop is in long narrow valleys subject to flooding, but, with water control, land levelling and bunding they could be very productive, especially with irrigation.

### 3.3 STRATEGIES AND CRITERIA FOR AGRICULTURAL DEVELOPMENT

#### 3.3.1 Allocation of Land

The requirement of the Scope of Work that development in the Study Area should be directed mainly towards new settlements on State Land has been accepted as the main strategy in the agricultural plan. However, because of the relatively small amount of land found suitable for agriculture it is recommended that in general:

- (a) Land found suitable for agriculture should be allocated to agricultural development after satisfying necessary allocations to urban settlements, industries, transport lines and terminals.
- (b) That all land not allocated for the above purposes or for National Parks should become permanent forest land.

These recommendations mean that to achieve the target of developing about 250,000 acres to agriculture about 170,000 acres of land at present in existing Forest Reserves and Protected Forests will need to be allocated to agriculture. On the other hand about 665,000 acres of State Land presently outside the Forest Reserves would need to be transferred to permanent Forest Reserves. These aspects are further discussed in Chapter 4.

### 3.3.2 Proper Land-use

Agricultural development should fundamentally be based on land capability classification. This presupposes the carrying out of semi-detailed soil surveys to define the limits of each land-use category. Detailed recommendations for matching agricultural enterprises with land capability classes are given in Supporting Report 1. Table 3.6 shows a grouping of the selected enterprises according to their suitability for different land slopes which, in the Study Area, is a major criterion for categorising land into capability classes.

The application of the criterion of land capability alone would lead to a patchwork cropping pattern, with some crops being grown on a scale too small to be easily marketed and processed, and too small to make them attractive for plantation type management. Some aggregation will be necessary to make homogeneous blocks of manageable size. For estate-type operations the approximate minimum acreages of blocks of the main crops should be:

Oil palms and rubber	...	...	...	...	200 acres
Cocoa	...	...	...	...	100 acres
Rice	...	...	...	...	50 acres

However, for small-scale farming individual crop areas may well be small, and there would often be advantages in having several enterprises contributing to the family income.

### 3.3.3 Concentration and Integration of Effort

Hitherto agriculture in the Study Area has, for reasons already explained, been scattered, of low intensity and productivity and impossible to service adequately because of poor communications, great distances to travel and a limited number of agricultural extension agents. In these circumstances, and where certain basic resources are scarce such as for example, capital, farming and managerial skills, and where suitable land is limited and vulnerable to misuse, concentration is the first principle for accelerating development.

The essence of future development must be to select promising, accessible areas for agriculture and to concentrate in them an intensive effort, in which all the technical and social factors affecting development are integrated. These intensive development areas should form the core of the plans for rural improvement. But although these areas will progressively expand and increase, it is implicit in such a development policy that many farmers will remain outside the intensive areas for some time to come. For them the normal Department of Agriculture extension services should continue, aimed mainly at minimising land destruction, improving food output and preparing the people for their eventual incorporation in intensive schemes by improving marketing conditions and continued provision of existing subsidy schemes.

TABLE 3.6 GROUPING OF POTENTIAL AGRICULTURAL ENTERPRISES ACCORDING TO SUITABILITY FOR DIFFERENT STEEPNESS OF LAND

Slope Range (degrees)	ENTERPRISES			Remarks	
	Annual Crops	Semi-perennial	Perennial		Other Enterprises
0-2	Swamp rice			Aquaculture	
0-6	Vegetables, pulses, maize, spices				If terraced, small patches could be grown on steeper land. Erosion control measures would be necessary on slopes above four degrees.
0-12		Essential oil crops, papaya, pineapples	Bananas		
0-20			Oil palms, cardamom, coconuts, pasture, annatto, coffee, cocoa, fruit trees	Pigs, poultry, cattle rearing	The tree and bush crops would need to be contour planted on slopes between 4 and 12 degrees. Terraces or platforms would be required on slopes above 12 degrees and complete ground cover necessary during establishment.
0-25			Rubber, pepper, cloves, nutmeg, cashew nut		Terraces or platforms would be required above 12 degrees. Between 4 and 12 degrees contour planting would be necessary and complete ground cover necessary during establishment.

### 3.3.4 Provision of Access Roads

In Volume I Chapter 2 it has been explained that the majority of the State Land available for large-scale development is some distance from the larger navigable rivers and is presently not accessible by road. Thus the construction of access roads to the new development areas is probably the most important single factor in implementing a policy of intensive development in the Study Area. Upon it depends the development process itself, the servicing of farmers, the export of produce and the mobility of people essential for efficiency and enterprise. For this reason the Miri-Bintulu Road, its increasing feeder links and the port prospects must comprise the basic structure on which the intensive development areas are selected.

### 3.3.5 Provision for Social Requirements

To achieve the aim of improving the farmers livelihood and their rural amenities requires that in the development plan a balance must be established between economic viability of the development on the one hand and the well-being and aspirations of the people for whom the development is undertaken on the other. To satisfy these requirements could necessitate the adoption of certain development approaches which have a high social benefit even though they might result in a lower economic rate of growth than would be achieved by development in some other, less socially orientated method.

Sociological investigations carried out in the Study Area indicated that in addition to the need for most families to cultivate a patch of rice, the following aspects would be of particular importance in planning the agricultural development:

- (i) That a large proportion of the people willing to participate in agricultural development, whether recruited locally or from other parts of Sarawak, will come from communities presently practising shifting cultivation. The majority of these people will have attitudes and expectations not associated with large-scale development. For example they will:
  - be unused and unprepared for the social environment created in a development area;
  - have a minimal knowledge of the cultivation techniques for the most important crops and enterprises suitable for development;
  - expect to have the prospect of establishing a personal relationship with an identifiable holding of land.
- (ii) The amenities considered most important by prospective settlers are:
  - security of persons and property;
  - easy access to health and schooling services;
  - facilities for worship and religious ceremonies;
  - opportunities for a diversification of employment especially for dependants of migrants families;
  - facilities for recreation.
- (iii) There are individuals and community groups in Sarawak with sufficient capital or creditworthiness as well as willingness to undertake agricultural development on their own account.

- (iv) There are also sections of the community who do not wish to become permanent farmers, either smallholders or private investors, but who require employment only for a relatively short period. There are others who would want agricultural employment but prefer to be employed and directed in their daily work.
- (v) That illegal occupation of land by local people is still prevalent and poses a serious problem to orderly development of the Study Area. A harmonious co-existence between the existing population and people from other Divisions settled onto State Land in the Study Area would be prejudiced if comparable assistance is withheld from the existing population in the legally occupied areas.

The strategies recommended to provide for these social needs are discussed below:

**(a) Providing for Varied Employment and Land Ownership**

The employment and land ownership aspirations of the community will require the establishment on State Land of estate-type holdings as well as individual farm holdings. The distribution of land between these two systems should be changed according to results and experiences obtained in the course of time. It is essential that the method of developing land should ensure flexibility from the beginning. A diversified cropping pattern determined by consideration of proper land-use as well as economic, marketing and management factors should be adopted. This would lead to an optimal use of land and, at the same time, it would provide added economic security by spreading the risks between more than one major crop. This aspect becomes particularly important when the management of land developed along estate-type lines, might be eventually transferred to smallholders.

In the agricultural plan provision is made for estate-type farming to be undertaken both by Government and private enterprise. Small-scale farming is provided for in two ways:

- (i) the establishment of smallholder farmers on State Land developed initially by a Government agency;
- (ii) the issue of smallholdings of undeveloped State Land to individuals with the ability and capital to undertake the development themselves.

**(b) Farmer Training and Provision of Social Services**

Since many of the potential participants in the new development areas will be unprepared for the changed social environment, organised re-orientation training and social welfare activities will be needed. Plans for providing these services are given in Chapter 2. The participant's need for agricultural training, guidance and support is provided for by:

- (i) arranging that the majority of the potential smallholder farmers that are selected for participation in schemes involving publicly developed land first undergo a probation period working as a labourer on a public estate;
- (ii) the creation of a specialised agricultural service that would operate only in the intensive development areas with the specific task of guiding and supporting all small-scale farmers.

### (c) The Provision of Amenities

To attract and retain persons to new development areas will require the rapid establishment of a reasonable level of the amenities they most require. This will necessitate early introduction of urbanisation, and a concentration of the people into villages and towns. The settlers and labourers associated with agricultural development will constitute virtually the only population in the development areas, therefore, they will have to provide the urban population.

The urbanisation policies adopted in the Regional Plan are described in Chapter 6. To satisfy the agricultural requirements of the participants it is recommended that sufficient suitable valley land is developed for wet rice cultivation to allow each permanent settler to be allocated one acre. In addition the new villages should be planned at a low housing density whereby the families would live on a homestead plot of about one acre on which the families should be encouraged to undertake the small-scale enterprises previously mentioned. To achieve this aim it will be essential to site the villages on good agricultural land. The general strategy recommended for these small-scale enterprises is to concentrate those requiring some processing (turmeric, ginger and essential oils for example) into selected villages, while other enterprises like the growing of pepper, coffee, annatto, cashew nuts and cardamom should be more widely scattered.

### (d) Provision of Opportunities for Private Investment and Initiative

It would be advantageous to the Government, the State and the individuals themselves to utilise the development potential that exists in the more wealthy section of the population.

It is proposed to set aside blocks of land for privately financed, commercial development. The location of the blocks should be such that their development will be an integral part of the overall plan. Sub-division of the blocks into individual holdings must await an assessment of the response to a Government announcement that the land will be available for private development. However, it is expected that the following types of holdings will be asked for and provision for them is made in the agricultural plan.

- (i) Smallholdings, of 15 to 20 acres in extent, that would be operated only by family labour.
- (ii) Larger holdings, of about 20 to 50 acres, that would be operated by the family assisted by hired seasonal labour.
- (iii) Holdings of sufficient size to require a large input of hired labour. In this category farms could vary from 50 to several hundred acres, while private estates could vary from several hundred to several thousand acres.

### (e) Inclusion of Present Inhabitants in Future Development

The need to include the existing population of the Study Area in the new development requires that the development should be spread throughout the Area. For reasons already explained in Volume I, Chapter 2 such a strategy was found impractical. Nevertheless considerable spread of development has been achieved by undertaking concentrated development in the nine Rural Development Areas (RDAs). However, the physical problems associated with agricultural extension work in the existing legally occupied areas still remain. The areas are huge, the communications poor, many of the lands are remote and are scattered and shifting agriculture is practiced.

In most cases the keys to the successful improvement of farming in such areas will be the road network and the agricultural and social infrastructures established during planned development of State Land. Access roads, either existing or planned, passing from schemes on State Land into legally occupied areas, will provide the opportunity for the people there to participate in new farming activities and take advantage of the facilities provided. Thus it is recommended that development in legally occupied areas should initially be either as narrow bands along the roads connecting the areas with development on State Land, or as a compact area development if the location of the land is particularly favourable in relation to State Land development.

### **3.3.6 Boundary Identification and Demarcation**

Although the land chosen for intensive development in accordance with the Scope of Work is largely unoccupied State Land, the continued encroachment of illegal occupation could seriously and adversely affect the development plans. It is important, therefore, that development of one type or another should begin soon in all unoccupied land, especially where it is adjacent to shifting cultivation areas or is easily accessible. Boundary demarcation between State Land and legally occupied land must be undertaken as soon as possible and should be preceded by a full explanation of the reasons for it. It should be made clear to local inhabitants that illegal encroachment must stop, but that those people illegally occupying land will be given an opportunity to participate in the schemes adjacent to them; and in the legally occupied lands assistance will be given to undertake enterprises associated with the main development.

As part of a policy of preserving the integrity of land identified for development and to facilitate the process of adjudication of legal boundaries, it has been recommended in Volume I, Chapter 3, Section 3.4.3(b) that the differentiation between legal and illegal occupation of land should be based upon the limit of clearing revealed in aerial photography taken between 1963 and 1968.

### **3.3.7 Full Utilisation of Forest Produce**

On forested land it will be important that the fullest possible use is made of forest produce; the harvesting of it being organised to be consistent with timely and expeditions clearing of land for agricultural use. This principle is imperative where subsequent agricultural development depends, as in the Study Area, largely on the planting of perennial crops from which the economic returns will be long delayed. The closest co-ordination will be required between all concerned with forestry and agriculture, both in planning and execution. The problem can be simplified somewhat in the first few years by giving priority for agricultural development to areas already logged, and the incentive to utilise a higher proportion of available timber sizes and classes will doubtless be improved by the construction of the new timber industry complexes.

### **3.3.8 Provision of Efficient Management and Adequate Technical Advisory Staff**

Financial returns to farmers in Sarawak and in the Study Area are at present lower than in Peninsular Malaysia. Transport and handling costs are higher, which adds to the cost of imported farm inputs and to the expense of marketing export products. Import duties are also higher on vehicles and plant; labour wage rates are higher, and labour productivity on the average is lower. Management staff

salaries, in both the public and private sectors, are substantially greater and, in the Study Area, road and port facilities are poor and road construction costs are high. Finally expensive soil conservation measures are required on much of the land.

In general this situation is likely to continue in the future and will necessitate that all development undertakings are efficiently managed. In addition, the need for good management is emphasised by the heavy reliance on tree crops in the development plan. Costs of establishing crops of this type are high, and no income accrues for some years. The standard of management during the years of establishment is known to have a marked influence on the later productivity of the mature plantation. There will be need for expensive processing facilities, particularly for oil palm fruits. This in turn will make demands on management, which must ensure that the production of good quality fruit is matched to the capacity of the mill. Moreover, as the oil deteriorates quickly after harvesting of the fruit bunch, it will be essential to have a strict system of quality control in the field, and efficient, quick transport of the bunches to the mill.

The basic aim in Government developed land should be to combine efficient primary land clearing, development and permanent crop establishment with an ultimate objective—progressively achieved—of meeting the understandable wish of many farmers to identify themselves with a piece of land and to manage it. It is recommended that the experience and efficiency of the SLDB be used to develop the land for smallholdings and for public nucleus estates around which selected smallholders and others can be helped to manage their own affairs. SLDB should provide centralised processing and marketing facilities for palm oil and wherever possible for the other enterprises too, so that advantage can be taken of economies of scale. The need to provide small-scale farmers with guidance on the correct husbandry techniques and give them support in the form of credit and marketing is met in the agricultural plan by the proposal to create special organisation within the Department of Agriculture—the Agricultural Development Unit (ADU). (The establishment and operation of the ADU is fully described in Supporting Report 2 Part III and is summarised in Appendix II of this Report. The roles of the SLDB and ADU in implementation of the agricultural plan are given in Chapter 9). The SLDB and ADU would work in close conjunction and in co-operation with all other Government agencies involved in implementing the Plan as a whole.

### 3.3.9 Adoption of a Diversified Farming System

The market analyses have shown that at present the demands for palm oil, natural rubber and cocoa exceed supplies, and prices are high. But the forecasts for the next decade are that supplies will outstrip demand, and there will be a gradual decline in the prices of all three commodities. Also considerable fluctuations, both short-term and long-term, can be expected in the prices of almost all the products of enterprises selected for inclusion in the agricultural plan. This necessitates that attempts must be made to provide some security, particularly to small-scale farmers, against fluctuations and falling prices of the main tree crops. These requirements reinforce the recommendation already made for the adoption of a diversified farming system and the inclusion within each estate, farm or small holding of at least two of the main tree crops.

## 3.4 THE AGRICULTURAL DEVELOPMENT PLAN

### 3.4.1 The Physical Aspects

The Scope of Work for this study set approximate development targets of about 250,000 acres of State Land to be developed during the next 20 years and about 50,000 acres (for which detailed plans should be drawn up) by 1980. These totals imply an average rate of development of 10,000 acres per year during the first five years increasing to 13,000 per year during the remaining 15 years. These rates have been found reasonable as targets for the main Government effort for development considering the need for Government to undertake agricultural schemes simultaneously in other parts of Sarawak. However, two aspects have necessitated recommendations to increase the overall rate of development especially during the early years.

Firstly, in order to prevent further widespread illegal occupation of land, which would obviously be encouraged by development in the area, there is an urgent need to implement some development in all presently unoccupied land. Consequently plans have been drawn up for agricultural development to be undertaken wherever unoccupied land has been found suitable for this, while other unoccupied areas have been recommended for incorporation into permanent Forest Reserves or National Parks.

Secondly, the need positively to assist people in the legally occupied land has been met by planning road based improvement schemes in areas where circumstances permit.

The proposed agricultural development is based on the enterprises and strategies previously described. The division of the Region, for development purposes, into nine RDAs is explained in Volume I, Chapter 2. In each RDA the agricultural plan aims to use either a nucleus enterprise that already exists as a basis for development or, where no nucleus exists, to create one by concentrating intensive agricultural inputs into relatively small areas. Thus in the Miri, Marudi, Lambir-Subis and Bintulu RDAs future agriculture has been orientated either towards supplying the needs of the increasing urban populations or towards reinforcing already established agricultural enterprises. In other RDAs a phased creation of nuclei has been planned.

Wherever possible development has been planned to include estate-type and smallholder farming designed to involve a wide selection of people and agencies. For private companies and individuals already able and wishing to undertake the full economic responsibilities of farming, recommendations are given for some land to be made available from the outset. But for the great majority of people who must achieve, by degrees, their aim to identify themselves with a piece of land and to manage it, the essence of the Plan is to use the experience and efficiency of the SLDB. It is proposed that SLDB should develop land for smallholdings and for public nucleus estates round which selected smallholders and others can be helped to manage their own affairs. The SLDB was created by the Sarawak Government in early 1971 specifically for implementation of its large scale agricultural development on State Land. The Board's organisation is orientated particularly towards estate-type development and for this reason proposals are made for the creation of an Agricultural Development Unit (ADU) within the Department of Agriculture aimed at providing all the various services that the small-scale farmers in the intensive development areas would require. This

arrangement is explained in Section 3.4.2. The ADU and SLDB would work in conjunction and in co-operation with all other Government agencies involved in developing the Plan as a whole. The agricultural development planned in each RDA is summarised in Table 3.7. It is fully described in Supporting Report 2, Part II.

The place names mentioned are given on the Regional Plan at the rear of the Report.

Detailed development plans have been made for those State Land areas surveyed at the semi-detailed level (roughly 112,000 acres). It was necessary to survey this total acreage in order to identify the 50,000 acres required for development by 1980. Criteria for the selection of areas to survey at this level were:

- that most of the land was at present unoccupied;
- that good road connections existed, or could easily be created, to Miri or Bintulu;
- that harvesting of the forest on the land was under way or completed;
- that new development could be associated with development already undertaken.

These conditions could only be met in the Lambir-Subis and Niah-Suai RDA's, consequently all the agricultural development planned in detail is confined to these two areas.

Detailed cropping patterns have been drawn up covering some 42,000 gross acres of this land. In addition about 7,500 gross acres have been planned at the same level for development as a beef ranch and a Livestock Production and Animal Husbandry Training Centre. These plans are fully described in Supporting Report 2, Parts II and V. A summary of the rate of detailed development is given in Table 3.8.

Allocation of land to different crops and to pasture has followed closely the land capability classifications described in Supporting Report 1, but factors relating to management and economies of scale have been taken into account. This has resulted in a measure of diversified cropping consisting mainly of oil palms and rubber, with smaller acreages of cocoa and rice in addition to small scale undertakings of the selected subsidiary enterprises on the one acre home-stead plots in the villages. These proposals are illustrated on the 1:50,000 scale map No. 20 in the Map Folder. The land blocks involved are: Mera-a, Karabungan, Igang, Galasah, Sebanah, Sawai, Lamaus, Ensabang, Jatan and Telabit. Their locations are shown on Figure 3.7 in Volume I, Chapter 3.

Implementation of the crop development programme is planned to be undertaken by SLDB with subsequent transfer of management in specified areas to smallholders supported by the ADU. Establishment of the beef ranch is recommended to be undertaken by the National Livestock Corporation (a Federal body) while the Sarawak Department of Agriculture would establish and run the Livestock Production and Animal Husbandry Training Centre.

The estimated build-up of crop and livestock production from these developments, and their economic evaluation have been given in Volume I, Chapter 3.

**TABLE 3.7 AGRICULTURAL DEVELOPMENT PLANNED IN EACH RDA**

<i>Rural Development Area</i>	<i>Agricultural Activity</i>	<i>Phasing of Activity</i>	<i>Implementing Agency</i>
Miri	Expansion and intensification of market gardening, rearing of pigs, poultry and pond culture of fish, turtle and freshwater prawns.	Continuous from 1975.	Present Extension Service of the Department of Agriculture.
Bintulu	Undertake road based improvement scheme in the Native Customary Land along the Miri Bintulu Road. Rubber planting, marketing, gardening and the rearing of pigs, poultry and fish would be the main enterprises.	Start 1976.	ADU.
	Construction of cocoa dryer.	1979.	ADU and private.
Lambir Subis	The management of about 40,000 acres of oil palms from areas already planted or presently under development and the operation of two oil palm mills.	Both mills in full operation by 1980.	SLDB, and Sarawak Oil Palms.
	Establishment of a commercial beef breeding ranch on about 5,600 acres.	1974-1977.	National Livestock Corporation.
	Establishment of a Livestock Production and Animal Husbandry Training Centre.	Start 1975.	Department of Agriculture.
	Development of about 3,705 acres of agricultural land at Meraa for eventual allocation to small-holders.	Start 1975.	SLDB.
	Release of about 25,000 acres for private development.	1975-1977.	Private investors.
	Establishment of ADU Headquarters and Training Centre at Kabaloh.	1974-1975.	Department of Agriculture.
	Undertaking road based improvement schemes in Native Customary Land close to Bukit Peninjau, Bekenu and Beluru.	Start 1975, and 1976.	ADU.
	Construction of eight cocoa dryers.	1978, 1979, 1980.	SLDB and private.
Marudi	Undertaking a road based improvement scheme in Native Customary Land. Rubber and to a lesser extent cocoa would be the main crops planted.	Start 1976.	ADU.
	Possible establishment of a rubber processing factory.	After study of potential production of existing rubber.	Department of Agriculture.
	Construction of cocoa dryer.	1979.	ADU and private.
Niah Suai	Development of about 62,700 acres of land for a public nucleus estate and 5 associated small-holder schemes.	1975-1983.	SLDB.
	Establishment of a large oil palm mill.	Start 1979.	SLDB.
	Support of a block alienation scheme and undertaking road based improvement schemes in Native Customary Land.	1975 to 1982.	ADU.
	Release of about 2,000 acres for private development.	1979 and 1981.	Private investors.
	Construction of 6 cocoa dryers.	One in 1978 and five in 1980.	SLDB.
Long Lama	Undertaking road based improvement in Native Customary Land. Rubber and to a lesser extent cocoa would be the main crops planted.	1977.	ADU.
	Construction of a cocoa dryer.	1980.	ADU and private
Sekudong	Development of about 52,000 acres of land for a public nucleus estate and about 5 associated smallholder schemes.	Starting 1983.	SLDB.
	Construction of a large oil palm mill.	Starting about 1987.	SLDB.
	Release of about 69,000 acres for private development.	1977 and 1984.	Private investors.
	Formation of an ADU Centre at Labang for road based improvement.	1977.	ADU.
	Formation of 5 other ADU Centres at future smallholder villages.	Starting about 1985.	ADU.
	Construction of an appropriate number of cocoa dryers.	Starting about 1987.	SLDB.
Labang-Tubau	The release of about 5,000 acres for private development of a nucleus estate and associated medium-sized farmers. Rubber would be the main crop.	1979 and 1980.	Private investors.
Nyalau	Development of about 30,000 acres for a small nucleus public estate and about 5 associated smallholder schemes.	Starting about 1988.	SLDB.
	Undertaking road based improvement schemes in Native Customary Land.	Starting about 1990.	ADU.

TABLE 3.8 ANNUAL DEVELOPMENT RATE IN DETAILED PLANNED AREAS

Year	Net acres Planted to Crops				Total Areas Developed to Crops		Village Areas Cleared (Acres)	Total Gross Equivalent Area Cleared (Acres)
	Oil Palm	Rubber	Cocoa	Rice	Other(1) Crops	Net(2) Acres		
1975	1,890	875	120	nil	nil	3,080	3,420	3,705
1976	3,245	370	nil	195	195	3,615	4,015	4,595
1977	3,945	1,410	875	425	425	6,660	7,400	8,045
1978	5,175	645	780	330	330	6,930	7,700	8,200
1979	4,035	2,530	nil	300	315	6,865	7,630	8,130
1980	5,980	770	450	nil	nil	7,200	8,000	8,000
to mid-1981	1,795	1,370	160	180	265	3,505	3,895	4,295
Total	26,065	7,975	2,385	1,430	1,530	37,855	42,060	44,970

Year	Pasture Planted Net acres	Estimated Gross Acres Cleared	Number of Animals Imported(3)	
			In-calf Heifers	Bulls
1974	750	1,000	nil	nil
1975	2,500	2,450	1,160	78
1976	2,250	2,500	580	39
1977	450	1,000	580	nil
1978	250	500	nil	nil
Total	6,200	7,450		

## \*B\* Beef Ranch and Training Centre

NOTES: (1) Represents acreages required for the 1 acre homestead plots for settlers within the villages.

(2) Acreages do not include the 1 acre homestead plots.

(3) Numbers refer only to requirements of the commercial ranch.

Less detailed or outline agricultural plans have been drawn up for the remainder of the land blocks identified at the broad transect soil survey level as having high proportions suitable for agriculture. The locations of these blocks are also shown in Figure 3.7 in Volume I. The development plans include proposals for blocks of State Land to be developed by SLDB and private investors while road based improvement schemes are proposed for legally occupied land.

It is planned that SLDB should continue with this development directly after completing the detailed planned schemes. Implementation would be continuous through to 1991. Release of land to private investors has been planned to start in 1976 and continue to 1984 by which time all the land considered suitable at the moment for this form of development will have been allocated. Plans for road based improvement have been made only for those schemes that can be started by 1980. Further planning of road based schemes was not considered meaningful because, if by 1980 they have proved successful, the possibilities for expansion are such that completely new plans would have to be made beyond 1981. In this Report for the period 1981 to 1991 only indications have been given of where road based schemes could be started along roads scheduled to be constructed as part of the Regional Plan. No roads have been planned in this period specifically for road based schemes. All these agricultural developments are fully described in Supporting Report 2, Parts II and III. Summaries of the estimated total acreages involved during the Action Programme Period have been given in Volume I, Chapter 3. In Table 3.9 the proposed rate of land clearing by SLDB after 1980 is given.

**TABLE 3.9 PROPOSED FUTURE RATE OF LAND CLEARING BY SLDB IN NON-DETAILED PLANNED AREAS (acres)**

Year	Rural Development Area			Total
	Niah-Suai	Sekudong	Nyalau	
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			10,000	10,000
1990-1991			10,100	10,000
<b>Total:</b>	<b>17,800</b>	<b>52,200</b>	<b>30,100</b>	<b>100,100</b>

**NOTE:**

The estimated net acreages of tree crops planted during the period are oil palms, 62,220; rubber, 16,130; cocoa, 5,940. These would be in addition to rice and subsidiary crops grown by the smallholders on their rice and homestead plots.

TABLE 3.10 THE PROPOSED PROGRAMME FOR ROAD BASED IMPROVEMENT AND BLOCK ALIENATION SCHEMES UP TO 1981

Year	Rural Development Area	Location of Scheme	Estimated Acreages Involved	
			Gross Acres	Net Crop Acres
1975	Lambir-Subis	Along roads close to existing SLDB Bukit Peninjau oil palm scheme	8,100	5,700
	Niah-Suai	Existing Sepupok Block Alienation Scheme close to Batu Niah	4,000	3,000
1976	Marudi	Along new road to Long Linei	5,700	4,000
	Lambir-Subis	Along existing road to Bekenu	7,300	5,200
	Lambir-Subis	Along existing road from Beluru extending towards Long Lama		
Bintulu	Along existing Miri-Bintulu Road	4,500	3,200	
1977	Niah-Suai	Along road extending from Batu Niah	8,300	5,800
	Long Lama	Along new road to Long Lama	5,000	3,500
	Labang-Tubau	Along new road connecting Labang to Miri-Bintulu Road	4,200	3,000
1978	Labang-Tubau	Along new road connecting Labang and Tubau	4,500	3,200

Allocation of land to private investors after 1980 would involve about 900 acres in the Ensabang land block in 1981 and about 2,700 acres in Sungai Mekasi during 1984. Both areas recommended to become small-scale farms.

For planning purposes it has been assumed that the overall cropping pattern in the areas developed by SLDB and private investors would be the same as in the detailed planned areas. For privately farmed areas a development period of three years has been assumed for small and medium sized farms while for estate holdings four years has been used. On these assumptions the estimated acreages of crops that would be planted by private developers during the Action Programme period has been given in Volume I, Chapter 3.

The proposed phasing for setting up ADU Centres for implementing road based improvement unit schemes is given in Table 3.10. The locations of the schemes are also described and can be identified on the Action Programme map at the rear of the Report.

On these schemes the following cropping patterns have been assumed.

	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
Totals:	255	255

The derivation of the patterns and assumptions which allow for a gradual increase in the number of farmers handled on each scheme are explained in Supporting Report 2, Part III. Using these assumptions it has been possible to estimate for each year the total number of farmers that would be handled and the total acreage of their crops by 1981. These numbers are given in Volume I, Chapter 3.

For all areas of unoccupied State Land planned for agricultural development, whether they are presently covered by virgin forest or partially logged forest, plans have been made (which are further explained in Chapter 4) whereby the fullest possible utilization is made of the forest produce before clearing of the land for agriculture. The planned phasing of release of the different land blocks from forestry is shown in Figure 3.7 in Volume I.

The build-up of crop and livestock production from the private and road based developments undertaken up to 1980 have been given in Volume I, Chapter 3. It has been assumed that the yields on the privately farmed areas will be the same as on the SLDB estates and smallholder farms, but that yields from the road based improvement schemes will be 15 per cent lower. This is because it is considered unlikely that farmers in the road based schemes will attain the high level of crop husbandry anticipated for the SLDB and private investor schemes.

### **3.4.2 Agencies for Implementing Agricultural Development**

The State-wide machinery for planning and co-ordinating the implementation of overall development is described in Chapter 9. Only the implementation of agricultural development in the Study Area is considered in this Section.

#### **3.4.2.1 The Sarawak Land Development Board (SLDB)**

In early 1971 the Government vested the SLDB to undertake large-scale agricultural development on unencumbered State Land. The Board was given wide and important roles which made it an ideal body for initiating rural development, and despite its short existence it has already successfully undertaken considerable development. In the Study Area, for example, by the end of 1973 approximately 20,000 acres of oil palms had been planted and about 12,000 additional acres were being cleared and planted to oil palms. Quite clearly the SLDB should be a major implementing agency in the future agricultural development of the Study Area.

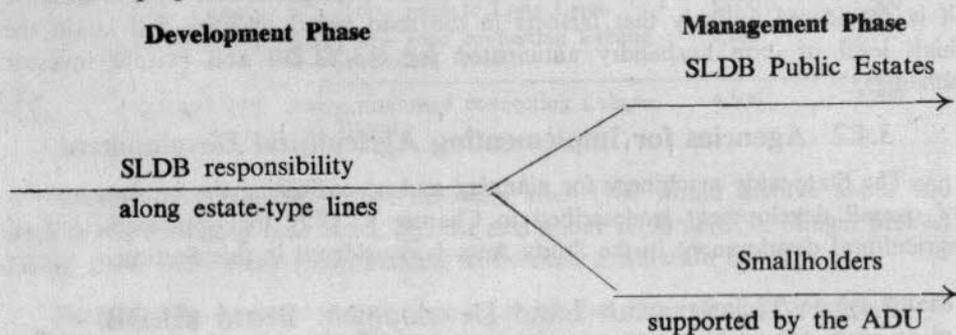
However, all development so far undertaken by the SLDB is of the estate-type, and although thought is being given to possible share participation by the workers in the profits of the schemes, there are no present plans for demarcating physical land holdings for each participant. In fact, there is no direct provision for smallholder development.

This particular orientation of SLDB is appreciated but it is recommended that in the future development the Board's role should be somewhat wider than at present. Its responsibility should extend beyond the opening and operation of public estates into a closer involvement with overall development. The proposal is that SLDB should be responsible for the initial development of all land allocated to it regardless of whether the developed land is ultimately destined for smallholders or public estates. In fact, the SLDB would operate in two phases covering Development and Management.

The Development phase would include clearing of the land, planting and maintenance of permanent crops up to a specified stage, and the establishment of central processing and marketing facilities for the crops planted. It would also include the clearing and drainage of swamp land for rice and preparation of the village areas. It is proposed too, that SLDB should organise the building programme of houses in service centres for the labourers on the public estates and in villages for smallholders in areas destined for sub-division. But the actual construction of the houses should be done either by the Housing Development Corporation or by private contractors.

The Management phase would begin when the main permanent crops reach maturity. At this stage responsibility for management of the developed land would split. SLDB would continue to manage areas destined for public estates which would form the nucleus for surrounding development and contain most of the processing facilities and the major town for the area. The management of the other developed areas would pass to selected smallholder families who would be guided and supported by the ADU.

These proposals are represented diagrammatically above.



For much of the initial work in the development phase SLDB would employ, as they do at present, experienced contractors because of the fundamental importance of protecting the land from erosion and getting the permanent crops well established. But from this stage onwards SLDB's labour force should be composed as far as possible of potential smallholders carefully recruited with a future independence in mind. Their paid employment would be combined with a programme, lasting about nine months and deliberately designed to give them farming experience, to test their suitability for becoming smallholders and to see if they themselves liked the prospects of a career on the land.

Two further important changes in SLDB's future operations in the Study Area are recommended. They are:

- (a) A reduction in the rate of land development. This arises from the Government's stated intention to increase SLDB's commitments in other parts of Sarawak.
- (b) Adoption of a diversified cropping pattern which would include rubber and cocoa in addition to oil palms. The reasons for this recommendation have already been explained.

A summary of the proposed SLDB crop planting and management programme covering the areas developed by the Board has been given in Volume I, Chapter 3 but is repeated in Table 3.11 for ease of reference.

In Figure 3.1 a diagrammatic representation is given of the development and cropping patterns of a nucleus estate and an associated area destined for subdivision into smallholdings. The only difference in the cropping patterns is the inclusion of rice lands in the smallholder sub-scheme. The boundary of this sub-scheme is about 1.5 to 2 miles from the village. The estate town with the crop processing facilities would be a maximum of 6.5 miles from the dividing boundary.

The actual development and cropping patterns recommended for the detailed planned areas are shown on Map 20 in the Map Folder.

In addition SLDB participation is planned in clearing land for the beef ranch and the Livestock Production and Animal Husbandry Training Centre during the period 1974 to 1978. The acreages involved are shown in Table 3.8 while the outline development programme for SLDB from 1981 to 1991 is given in Table 3.9. A summary of the present and proposed future total land clearing programme for SLDB is given below:

<i>Year</i>	<i>Gross Acres to be Cleared for all Development</i>
1973-74	17,150
1974-75	6,505
1975-76	7,095
1976-77	9,045
1977-78	8,200
1978-79	8,130
1979-80	8,000
1980-81	8,000
1981-82	} approximately 10,000 per year
to	
1990-91	

The considerable reduction from present commitments (1973-1974) to future proposals 1975 onwards is very evident.

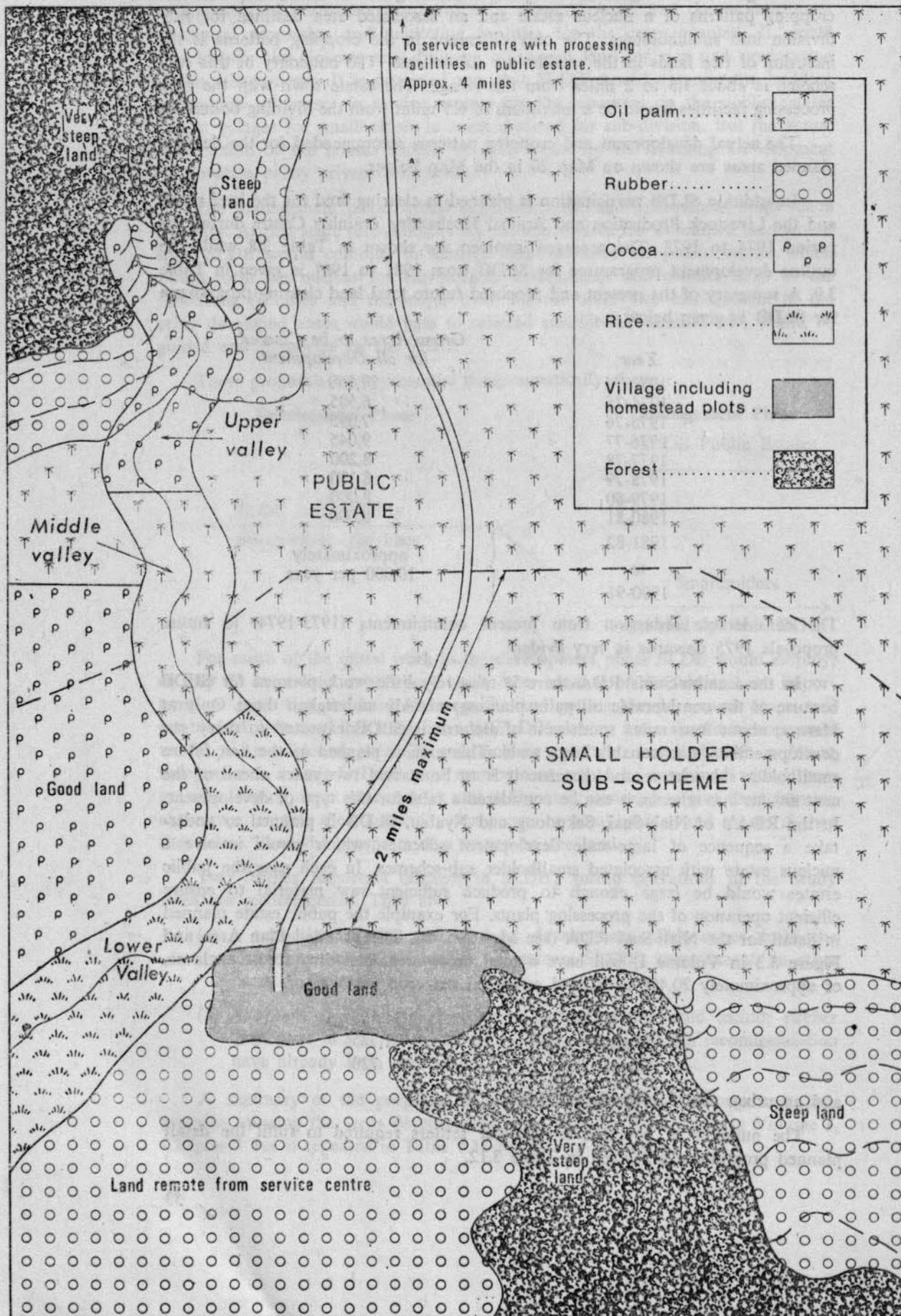
In the Lambir-Subis RDA there is relatively little work planned for SLDB because of the considerable oil palm plantings already undertaken there. Only at Mera-a, about four miles south-west of Beluru, is SLDB expected to carry out development on a reasonably large scale. This area is planned as the first future smallholder sub-scheme and, because it is to be started two years ahead of the next similar sub-scheme, it can be considered a trial for this type of development. In the RDA's of Niah-Suai, Sekudong and Nyalau, SLDB is planned to undertake a sequence of large-scale development schemes, which would involve a nucleus estate with associated smallholder sub-schemes. In each case the public estates would be large enough to produce sufficient raw material to ensure efficient operation of the processing plants. For example the public estate planned in detail for the Niah-Suai RDA (see Map No. 20, The Detailed Plan Area and Figure 3.3 in Volume I) will have a total gross area, including forest enclaves, of approximately 20,400 acres and estimated net crop acreages of:

Oil Palms	11,185
Rubber	1,785
Cocoa	720

and an urban centre covering 580 acres.

The numbers of potential smallholder settlers required to fulfil the detail planned programme are given in Table 3.12.

# DIAGRAMMATIC REPRESENTATION OF CROPPING PATTERNS ON ASSOCIATED ESTATE AND SMALL-HOLDER SCHEMES



**TABLE 3.11 PROPOSED FUTURE PERMANENT CROP PLANTING AND MANAGEMENT PROGRAMME FOR SLDB  
IN THE AREAS DEVELOPED BY THE BOARD**

Year	Net Planted Acres			Approximate Gross Acreage Cleared Including Rice and Village Areas	Rural Development Area	Remarks Concerning Management
	Oil Palms	Rubber	Cocoa			
1975 ...	1,890	875	120	2,885	Lambir Subis	Mera-a sub-scheme; developed by SLDB for allocation to smallholders at the end of 1978.
1976 ...	3,245	370	nil	3,615	Niah-Suai	Central area of public estate (Igang); developed and managed by SLDB.
1977 ...	3,945	1,415	875	6,235	Niah-Suai	Galasah and Sebanah sub-schemes; developed by SLDB for allocation to smallholders at the end of 1980.
1978 ...	5,175	645	780	6,600	Niah-Suai	Southern part of the public estate (Sawat); developed and managed by SLDB. Part of Lamaus sub-scheme; developed by SLDB for allocation to smallholders at the end of 1982.
1979 ...	4,035	2,530	nil	6,565	Niah-Suai	Remainder of Lamaus and all Ensabang sub-schemes; developed by SLDB for allocation to smallholders at the end of 1982.
1980 ...	5,980	770	450	7,200	Niah-Suai	Northern part of the public estate (Jatan); developed and managed by SLDB. Part of Telabit sub-scheme; developed by SLDB for allocation to smallholders in late 1984.
up to mid-1981	1,795	1,370	160	3,325	Niah-Suai	Remainder of Telabit sub-scheme; developed by SLDB for allocation to smallholders at the end of 1984.
mid-1981 to mid-1983 ...	—	—	—	21,505	Niah-Suai	Three sub-schemes in the Kabatu land block developed by SLDB for subsequent allocation to smallholders. Details to be planned following semi-detailed soil survey.

**TABLE 3.12 THE NUMBER OF POTENTIAL SMALLHOLDERS  
REQUIRED UP TO MID-1981**

<i>Years</i>	<i>Number of Potential Smallholders Required</i>
1975	194
1976	nil
1977	427
1978 and 1979	649
1980 and 1981	268
Total:	1,538

At present the SLDB organisation in the Study Area is controlled by a Regional Manager with a Group Manager in the Lambir-Subis Development Area and six Scheme Managers; one on each of the existing schemes.

At some stage during the implementation of the proposed detailed development the task of the Regional Manager will become too great for one man. The stage at which this occurs will depend largely on the ability and quality of the Scheme Managers; the better they are the longer the Regional Manager will be able to manage alone. But eventually a second Group Manager responsible for the physical development in the Niah-Suai Rural Development Area will be required. The SLDB organisation in the Study Area as it is expected to appear in 1978 is shown in Figure 3.2.

The adoption of a diversified cropping pattern will necessitate some increase in SLDB's field staffing rate and in its technical agricultural services because rubber and cocoa are more demanding of management than oil palms and require a relatively greater staff input. This need for greater field managerial input has been accounted for, in the estimates of staff requirement given in Table 3.13, by allowing for the following approximate staffing rate in relation to planted acreage of the two crops. These rates are more intensive than for monocultural oil palm estates.

An Assistant Manager for every 1,500 to 2,000 acres

A Field Supervisor for every 750 to 1,000 acres

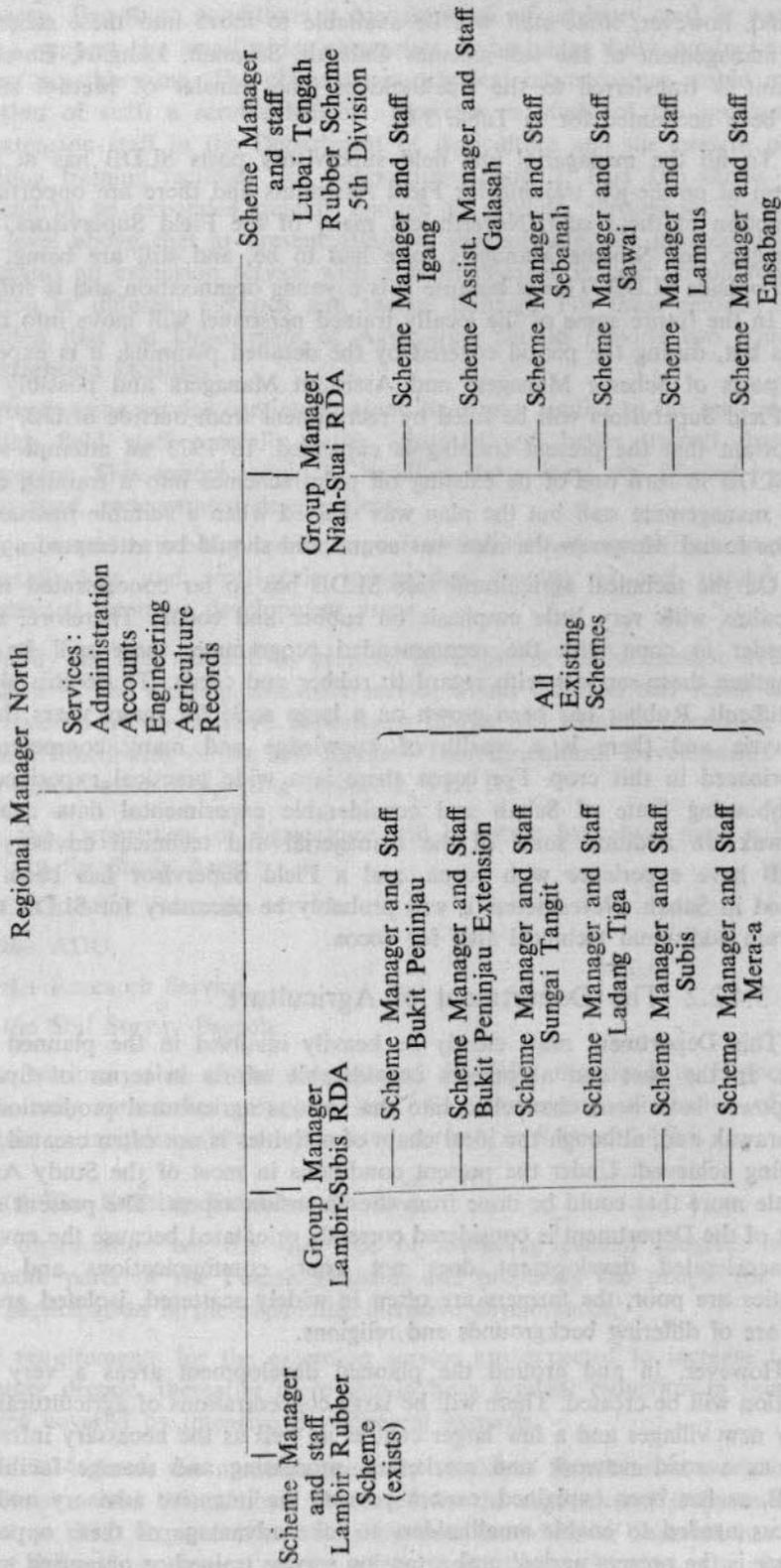
A Field Assistant for every 325 to 500 acres.

Detailed requirements for management staff and labour for the individual crops are given in Supporting Report 2, Part IV.

**TABLE 3.13 NEW MANAGERIAL AND FIELD STAFF REQUIREMENTS  
FOR THE SLDB DEVELOPMENT PROGRAMME**

<i>Staff Cadre</i>	<i>New Staff Required each Year</i>					
	1975	1976	1977	1978	1979	1980
Scheme Manager	1	1	2	1	0	1
Assistant Manager	1	2	3	2	4	2
Field Supervisors	3	2	8	8	7	2
Field Assistant	5	6	12	10	21	3

FIGURE 3.2 POSSIBLE FUTURE ORGANISATION OF SLDB (1978) IN THE STUDY AREA



These are staff requirements for implementing the detailed planned programme. After 1980 the other schemes, planned in outline, are expected to be started, however, some staff will be available to move into these schemes when the management of the sub-schemes Galasah, Sebanah, Lamaus, Ensabang and Telabit is transferred to the smallholders. The transfer of Mera-a sub-scheme has been accounted for in Table 3.12.

To fill the managerial and field supervisory posts SLDB has at present a system of on-the-job training for Field Assistants and there are opportunities for promotion of these staff. Nevertheless many of the Field Supervisors, Assistant Managers and Scheme Managers have had to be, and still are being, recruited from outside SLDB. This is because it is a young organisation and is still expanding. In the future some of the locally trained personnel will move into the higher posts but, during the period covered by the detailed planning, it is expected that the posts of Scheme Managers and Assistant Managers and possibly some of the Field Supervisors will be filled by recruitment from outside SLDB. Thus it is important that the present training is expanded. In 1973 an attempt was made by SLDB to turn one of its existing oil palm schemes into a training centre for field management staff but the plan was shelved when a suitable instructor could not be found. However, the idea was sound and should be attempted again.

On the technical agricultural side SLDB has so far concentrated mainly on oil palms with very little emphasis on rubber and cocoa. Therefore, in future, in order to cope with the recommended programme, there will be need to strengthen these services with regard to rubber and cocoa. To do this should not be difficult. Rubber has been grown on a large scale for many years throughout Malaysia and there is a wealth of knowledge and many competent people experienced in this crop. For cocoa there is a wide practical experience in the neighbouring State of Sabah and considerable experimental data available in Sarawak. In addition some of the managerial and technical advisory staff in SLDB have experience with cocoa, and a Field Supervisor has been specially trained in Sabah. Nevertheless it will probably be necessary for SLDB to recruit or train additional technical staff for cocoa.

#### 3.4.2.2 The Department of Agriculture

This Department must clearly be heavily involved in the planned development. In the past and at present considerable efforts in terms of finance and manpower have been channelled into the various agricultural production services in Sarawak and, although the ideal chain of activities is not often created, progress is being achieved. Under the present conditions in most of the Study Area there is little more that could be done from the extension aspect. The present extension effort of the Department is considered correctly orientated because the environment for accelerated development does not exist; communications and transport facilities are poor, the farmers are often in widely scattered, isolated groups and they are of differing backgrounds and religions.

However, in and around the planned development areas a very different situation will be created. There will be large concentrations of agricultural activity, many new villages and a few larger centres as well as the necessary infrastructure such as a road network and marketing, processing and storage facilities. The SLDB, as has been explained, cannot provide the intensive advisory and support services needed to enable smallholders to take advantage of these opportunities. Neither is the present agricultural extension service trained or organised to operate

effectively in the new environment that would be created in and around the planned areas. For these conditions a concentration of advisory staff is needed in order to support the smallholder enterprises in becoming fully productive in the shortest possible time. The planned new physical infrastructure would make the operation of such a service feasible. However, a study of the number of existing extension staff in the Department of Agriculture and the present plans for extending training facilities (see Supporting Report 2, Part III) shows that numbers cannot be expanded quickly enough to provide, throughout Sarawak, a service level above that at present attained. Furthermore, the new conditions would demand an extension service with a fresh orientation, and would require the adoption of different methods and special training. For these reasons it is recommended that the Department of Agriculture should provide two complementary extension facilities:

- (i) The existing service continuing along lines very similar to the present but with field staff generally better educated and better trained than at present. This service would be handling those areas not affected by the planned, concentrated development.
- (ii) A new and expanding service organised and trained especially to support smallholder and small-scale independent farmers in and around the planned intensive development areas.

Gradually the area covered by planned development would increase and the area handled by the existing extension service would diminish and result in an eventual reversal of the relative importance of the two extension services. The creation and functioning of the new service—The Agricultural Development Unit—is fully described in Supporting Report 2, Part III.

Thus the Department of Agriculture will in future have four main spheres of activity in the Study Area:

- the existing extension service,
- the ADU,
- the Research Service,
- and the Soil Survey Branch.

These various roles of the Department are fully discussed in Supporting Report 2; only summaries are given here. For convenience discussion of soil survey tasks is included with other related surveys in Section 3.4.2.5.

#### (i) The Existing Extension Service

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

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

Table 3.14 shows the numbers presently employed in extension work in the Fourth Division and the numbers estimated by the Agricultural Department to be needed in 1982. Expansion on this scale over the whole of Sarawak has been shown to demand a greater output of personnel than the presently planned capacity of the Department's training facilities.

TABLE 3.14 PRESENT AND ESTIMATED FUTURE STAFF REQUIREMENTS FOR THE AGRICULTURAL DEPARTMENT EXTENSION SERVICES IN THE FOURTH DIVISION

<i>Staff Category</i>	<i>Number of Staff*</i>	
	1972	1982
<i>Degree</i>		
Agricultural Officer	1	4
<i>Diplomate</i>		
Assistant Agricultural Officer	7	15
<i>Local Certificate</i>		
Agricultural Assistant	71	170
<b>Total:</b>	<b>79</b>	<b>189</b>

\* Source, Department of Agriculture, Kuching.

(ii) **The ADU**

The importance of the role of ADU cannot be over-emphasised. Success in persuading and encouraging farm families to change from their traditional pattern of life to settled existence and sustained hard work in an urbanised rural environment, will depend very largely indeed on the capacity and quality of ADU and the supporting social services.

ADU will not only be responsible for guiding and supporting the smallholders managing land developed by SLDB, but also those involved in block alienation schemes, farmers on legally occupied land and on small private holdings. ADU's services, which would include extension, credit and marketing, would be backed by the full resources of the Department of Agriculture, to be called upon when required. The duties of its staff will therefore be manifold and technically diverse; but, as with all extension services, success will ultimately turn on the method and manner of approach. The education and training of ADU personnel is therefore of greatest importance. This aspect is fully considered in Supporting Report 2, Part III.

A training programme is 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 could train ADU staff for the whole State. Training of staff specifically for ADU is planned to start in 1975, and it will be necessary to establish a Fourth Division ADU headquarters during 1974. This is also planned to be at the Kabuloh Farmers Training Institute. The staff required during 1974 are:

- an experienced Agricultural Officer to be in charge of the whole Fourth Division ADU;
- a Specialist in agricultural extension training;
- an Executive Officer to relieve the Agricultural Officer of direct involvement in administrative details.

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

To make all farmers increasingly self-reliant both as individuals and collectively would be an important ADU aim. Therefore, at an early stage and before farmers become too dependent on ADU, they would be encouraged to form organisations to handle some of their own services, for example the supply of inputs or crop collection and transport.

The number of farmers involved and the acreages of crops planted in the road based improvement schemes and the block alienation scheme which would be the responsibility of the ADU, have already been given in Volume I, Chapter 3. In addition ADU would be closely associated with those SLDB sub-schemes destined for sub-division into smallholdings.

The first task of the ADU teams, who would move into the schemes at the same time as the settlers, would be to guide and support cultivation of the swamp rice plots and the homestead plots. Later when the tree crops attained maturity, about five years from clearing, SLDB management would cease and ADU would sub-divide the blocks of oil palm and (if available) cocoa among the smallholders, who would thereafter be responsible for the management of the crops, aided by the ADU. Any rubber areas would continue to be managed as undivided blocks by ADU until ready for tapping—about seven years from clearing—when the blocks would be sub-divided among the smallholders.

The swamp rice and other crop acreages involved in this development are included in Table 3.8.

Because the ADU is intimately associated with the creation, guidance and support of smallholder farmers it is appropriate that the proposals concerning this aspect are discussed.

Firstly, there is the establishment of smallholder farmers. Those people proven suitable, during work on an SLDB estate, to become farmers (and providing they themselves wish to do so) would move into villages built for them on specific SLDB sub-schemes. Each family would be immediately allocated a swamp rice plot and a homestead plot both of which would be planted and developed with the guidance and support of the ADU. The settlers would continue to work under SLDB management as estate labour force until such time as the developed land is sub-divided and allocated as smallholdings in the manner already explained.

Then there is the size and composition of smallholdings. Four main factors have together determined the most suitable size for a smallholding, a family's work capacity, especially in periods of peak demand; the labour requirement of the preferred cropping pattern; the net target income; and the loan repayment capacity.

The main farming enterprises will comprise oil palms, rubber and cocoa. For these the demand and prices, as already explained, are uncertain and subject to wide variations. Therefore, the pattern on each holding is planned to be as diversified as land-use criteria permit and the size of the holdings as large as can be reasonably handled by individual families.

The intention is to give a smallholder a swamp rice plot and a homestead plot each of one acre. This recommendation is aimed to fulfil the traditional wish for adequate rice land and to provide productive employment for the whole

family near home. These plots would provide the family's subsistence requirements of staple food, fruit, vegetables, small stock and often pond-cultured fish. In addition each holding is planned to have a plot of oil palms and one other plot of either rubber or cocoa.

With a diversified pattern of the main perennial crops disposed around a village in accordance with land classification criteria, the determination of the optimum unit size of each tree crop to allot to an individual farmer is not easy. A system of modules has been worked out, a module being the minimum unit size of land of a particular crop that will provide sufficient work, for most cultural operations, to justify a smallholder in making a journey to it. The disposition of modules would be such that no farmer would have to walk more than about 1.5 to 2 miles from his village.

The module sizes that have been adopted are: oil palms and rubber approximately five acres, cocoa about four acres. According to the total area of these main crops available within the village lands, a smallholder would be allotted one or more modules to give him a total holding size that correspond approximately with his wishes and family labour capacity.

Given below are the composition of the five different holdings used in the detailed development plan. They are dependent upon the relative acreages of main crops available in the village areas and based on an average family of two man-power units.

<i>Plot</i>	(a) <i>acres</i>	(b) <i>acres</i>	(c) <i>acres</i>	(d) <i>acres</i>	(e) <i>acres</i>
Homestead	1	1	1	1	1
Rice	1	1	1	1	1
Oil Palm	9	10	11	10	9
Rubber	6	5	4	0	0
Cocoa	0	0	0	4	5
Totals:	17	17	17	16	16

Modules, from their definition, would not be sub-divided; but it is envisaged that whole modules could be negotiable assets which, with suitable controls, would allow enterprising farmers to acquire more land from those who preferred less.

The annual labour requirements of the various holdings, based on detailed labour requirements given in Supporting Report 2, Part IV, are summarised in Table 3.15 which shows that on an annual basis the work load would not exceed the capacity of the average family consisting of two full-time worker equivalents.

Lastly, there is the target net income. The target net income adopted was \$2,500 to \$3,000 per family and the socio-economic considerations and calculations from which the optimum size holding was evolved are given in Supporting Reports 2 and 4. The target income was derived on the basis of the earning potential of the full-time workers available in an average family, assuming full-time employment and current 'take-home' wages for unskilled workers employed in agriculture.

The net sale or consumption values of the rice and homestead plot enterprises is expected to amount to about \$500 out of the total income, the bulk of which would come from the tree crops. In addition there would be the accommodation value of the house.

TABLE 3.15 LABOUR REQUIREMENTS FOR TREE CROP PRODUCTION ON THE PROPOSED SMALLHOLDINGS

	Years of Scheme											
	1	2	3	4	5	6	7	8	9	10	11	12 and following
<b>Farm type (a)</b>												
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
<b>Farm type (b)</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
<b>Farm type (c)</b>												
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
<b>Farm type (d)</b>												
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
<b>Farm type (e)</b>												
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	1.0	1.0	1.0	1.0	1.0

### 3.4.2.3 The National Livestock Corporation (NLC)

The Corporation has been set up by the Federal Government of Malaysia to undertake and promote livestock development throughout the Federation. Up to the present the Corporation has not operated in Sarawak though it has several ongoing schemes in Peninsular Malaysia.

The favourable prospects for beef in Sarawak have already been mentioned. The climate is conducive to abundant growth of grass and forage, and there are at present no major endemic diseases. But local knowledge and experience of cattle rearing and pasture management are limited, also there are relatively few cattle in the State and very few beef-type animals. Therefore, development should at first be restricted to creating a breeding herd under specialised management with the objective of establishing a foundation herd of beef-type cattle as a basis for the creation of a stratified beef industry in Sarawak. The NLC is undertaking this first project, and is responsible for the organisation of processing and marketing facilities. The Sarawak Department of Agriculture would support this development with its Livestock Production and Animal Husbandry Training Centre located adjacent to the ranch. The ultimate objective of these two institutions should be the extension of beef cattle farming to as wide a section of the community as possible. For example, in addition to the sale of breeding stock to establish other foundation herds, the ranch could make young stock available to farmers and smallholders for fattening the animals as a joint venture between the farmers and the NLC.

The ranch project which is described in Supporting Report 2, Part V, is proposed for a total area of about 5,600 acres at Karabungan (see Figure 3.1 in Volume I). It is proposed that SLDB should clear and prepare the land for pasture planting while NLC undertakes all further development.

The programme for development is summarised in Table 3.16, where it is shown that clearing has already started. The proposals include the importation of about 2,300 in-calf, cross-bred Brahman heifers from Australia over a period of three years, and the importation of pure-bred Brahman bulls from America.

**TABLE 3.16 SUMMARISED PROGRAMME OF ESTABLISHMENT OF THE BEEF CATTLE RANCH**

<i>Operation</i>	<i>Year</i>				
	1973	1974	1975	1976	1977
Adjudication by Administrative Officers of boundaries of legal occupation					
Survey and demarcation of Forest Reserve boundaries by Land and Survey Department and Forest Department					
Land clearing by SLDB		1,000 acres	2,000 acres	2,000 acres	
Pasture establishment by NLC					
Importation of Cattle					
Commencement of Grazing			X		

### (i) The Research Services

The Agricultural Department already plans considerable expansion of research in the Fourth Division. The existing Kabuloh Research Station is being built up into the main centre for the northern region of Sarawak. There is also at present a rice testing station at Paya Selanyau close to Bekenu. In addition the Government plans to establish a Livestock Production and Animal Husbandry Training Centre not far from Kabuloh, and to build an Agricultural University at Bintulu which would have considerable research facilities. Thus the investigation aspect of agriculture is likely to be well cared for in the Study Area. But it will be important that the work is sufficiently orientated towards the particular requirements of the development programme. Details of investigations needed for specific crops, livestock and fisheries enterprises are given in Supporting Report 2, Parts IV and V, summaries are given below.

Basically the future aims of research in the Study Area should not differ greatly from the present objectives, namely:

- to investigate the feasibility of growing new crops and crop varieties in the area;
- to investigate new agronomic and husbandry practices for crops already grown commercially;
- to evaluate successful commercial farming and pin-point subjects requiring investigation.

It will be particularly important for the work to provide the basic practical farming information (both technical and economic) which would be needed as teaching material for the extension, supply and credit staff of the ADU. The economic aspects of agriculture will be so important to the private and small-holder farmers that it is recommended that a trained agricultural economist is attached to the staff at Kabuloh. He would be responsible for ensuring the economic soundness of any production, processing or marketing innovations recommended to farmers, and to formulate the recommendations into a convenient form for use by the ADU staff. In this respect he would need to co-operate in work already started at Semongok (Sarawak's main research station located near Kuching) on present farm management and farm accounts in order to establish bench marks on which to base new research and against which to gauge changes in farming methods.

At Kabuloh Research Station the cocoa hybrid trials should be greatly extended. Investigations should aim at finding the best hybrids to use, the best soils to select and the most suitable fertiliser and pest control regimes, using techniques and shade species already proven in Sabah and Sarawak. Field-scale (two to five acres) plantings of robusta coffee, lowland tea, annatto, lemon grass, citronella grass and patchouli should be planted to establish their suitability as diversification crops. The present cashew nut trial should be continued and extended to other soil types. Also the possibility of grazing beef cattle among the cashew trees should be investigated. Further production trials should be undertaken of turmeric, ginger, chillies and vetiver grass for extraction of colouring and

flavouring material; tapioca for production of dried chips, various fruits and illipenuts. Of the fruits, special attention should be given to citrus, rambutan, durian, papaya, mangosteen, pineapple and bananas. A mango variety trial is already established. The present investigations on oil palms should continue but adjusted whenever necessary to search for solutions to specific problems encountered in the oil palm plantations in Sarawak. The effects of grazing beef cattle among the palms should be investigated. Soil conservation trials, particularly associated with pepper growing, should be undertaken. For coconuts, trials of high yielding, hybrid varieties should be started.

At the Paya Selanyau Rice Station the double cropping and rice variety trials should continue. In addition the growing of short-term crops such as vegetables, soya beans and maize for green cob production should be started in unirrigated wet rice areas during the rice off-season. The work should cover cultural and fertiliser requirements, weed control, entomology, pathology and processing as well as the economic aspects of applying new innovations.

The Livestock Production and Animal Husbandry Training Centre should take the responsibility of carrying out practical investigations on pasture development and pasture management as well as rearing of cattle, buffaloes, pigs and poultry. The beef cattle investigations should support and be complementary to the activities of the commercial ranch which will be aimed at producing beef breeding stock for other ranches as well as young steers for rearing and finishing on estates, private farms and smallholdings. Thus an important aspect of work on the Livestock Centre would be working out and testing details for such a programme. Tests and investigations with pigs and poultry on locally available feedstuffs (waste from oil palm mills, trash sea fish, pond fish, tapioca, etc.) should also be carried out.

The Agricultural University should, in addition to its teaching aspects, carry out agricultural and sociological investigations. Besides agronomic trials and demonstrations which could be undertaken on a university farm, it is recommended that the sociological studies should be carried out in the development areas which would be within easy reach of the University. The studies should aim to gain knowledge of the difficulties faced by participants in the development schemes whether they are estate workers, smallholders or private farmers.

An estimation of the staff requirements for research (not including administration) in the two major research establishments is given in Table 3.17. The table shows that as the work-load builds up in the future so an increase in research staff can be expected. The projections beyond 1980 are subject to considerable change and it will be necessary to keep the work under continual surveillance and to adjust staff numbers in accordance with the long-term outlook.

The broad nature of the work in both crop and animal husbandry will require that close co-operation is maintained with the specialist research staff at Semongok, and such an arrangement is assumed to occur in the estimation of staff requirements.

**TABLE 3.17 ESTIMATED TECHNICAL STAFF REQUIRED FOR AGRICULTURAL INVESTIGATION IN THE FOURTH DIVISION AT THE MAJOR INSTITUTIONS**

	1974	1975	1976	1977	1978	1979	1980	1990
<i>Kabuloh Research Station</i>								
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
<i>Livestock Production and Animal Husbandry Training Centre*</i>								
General Manager (an Animal Husbandry Specialist)	—	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
Agricultural Assistants	—	1	2	3	4	4	4	4
Laboratory Assistants	—	1	2	3	4	4	4	4
Experienced Herdsmen	—	1	2	2	2	2	2	2

\* All personnel would be local except for the General Manager and two experienced herdsmen. These would be replaced by trained local staff after about five or six years.

#### 3.4.2.4. Private Enterprise

The reasons for including private enterprise in the agricultural programme are threefold:

- (i) To provide a congenial, profitable and useful outlet for capital and energy of people in Sarawak willing and able to undertake agricultural development on their own behalf.
- (ii) To provide an accelerated solution to the problem of continuing illegal occupation of State Land. The proposed rate of SLDB and NLC development in the Study Area, if accepted as the only development agencies in State Land, would leave many areas vulnerable to illegal encroachment. The incorporation of private enterprise in the development plan would alleviate the problem with relatively little cost to Government and virtually no competition for capital and manpower resources.
- (iii) To attract foreign expertise and capital into the Area.

Consequently the release of land, as already mentioned in Section 3.4.1, to private enterprise is recommended. This would provide opportunities for private companies and individuals to invest in agricultural enterprises as integral parts of the whole development plan. The response which Government might receive from the private sector, following announcements that land could be made available for private farming, is not known. But it is expected that applications would be received for farms ranging in size from small family-run concerns (up to 50 acres for example), through medium size farms of several hundreds of acres and employing hired labour, to large estate-type undertakings similar to the present SOP estate in the Lambir-Subis RDA.

The agricultural plan accommodates all these possibilities. Small-scale private farming is recommended in areas which are close to SLDB public estates and which are easily accessible to ADU staff, thus processing and marketing facilities

would be easily available and support from the ADU readily obtained. Medium and large-scale private enterprises are proposed for areas generally slightly further from SLDB activities but still generally able to take advantage of them.

An exception in this respect is in the large blocks of unoccupied land in the Labang-Tubau RDA where estate-type private development is recommended in order to create the nucleus development on which expansion into surrounding occupied land could be based. In these areas rubber could be the main crop, but in all other areas private farming is expected to follow the same diversified cropping pattern as proposed for SLDB with oil palms as the main crop.

It is recommended that land for private farming should be allocated on long-term leases and that the contract terms should include clauses to ensure rapid development and proper land-use.

The proposed schedule of allocation of land for private development has been given in Volume I, Chapter 3 for the AP-period and in Section 3.1 of this volume for the remaining period. Recommendations are also given for farm types on each land block. The allocation is arranged to co-ordinate with forest harvesting, with other agricultural development and the road construction programme.

### 3.4.2.5 Supporting Government Development Activities and Agencies

Orderly implementation of the agricultural (and forestry) development plans will depend to a large extent on satisfactory solutions to the problems of determining and demarcating the boundaries between agricultural land and permanent forest land as well as between unencumbered State Land and Native Customary Land. There are three separate issues involved:

- the physical problem of determining the suitability of land for one use or another; this requires semi-detailed soil surveys and land-use mapping;
- a social and political problem of deciding the division between legal and illegal occupation; this requires adjudication by Administrative Officers;
- a physical problem of surveying and demarcating the boundaries; this involves field survey and demarcation as well as mapping.

During the course of this Study semi-detailed soil surveys were completed on only 112,000 acres out of the approximate 600,000 acres identified at the broad transect survey level as having high proportions suitable for agriculture. Map No. 20 in the Map Folder show, for the semi-detailed surveyed land, the boundaries between future agricultural land and future permanent forest land. However, no surveying or demarcation on the ground has been done nor has any attempt been made to determine the exact legality of the occupied land included in the surveyed areas. Thus there is considerable vital work required before development can proceed smoothly even in the detail planned areas, and still more work is required in those parts surveyed only at the broad transect level.

Detailed programmes for undertaking these various surveys and the demarcation of boundaries are given in Supporting Reports 2 and 3 and have been summarised in Volume I, Chapter 3.

### 3.4.2.6 Supply of Credit

It is anticipated that the finance required by the SLDB and NLC for their development programmes will be obtained from Federal sources who in turn could negotiate with International leading agencies.

Credit for private investors would be handled through normal banking channels including the Bank Pertanian. An important criterion for selection of persons and companies to whom land would be allocated would be their actual creditworthiness at the time of selection.

In Supporting Report 2, Part III, detailed recommendations are given for the handling of credit by the ADU for supporting smallholder farmers on the SLDB sub-schemes and participants in road based improvement schemes. It is recommended that the Bank Pertanian should set up an office in Sarawak and loan money to the ADU who would be responsible for repayment. The provision of credit (most often in the form of goods and services) would be part of a whole package service operated by the ADU for specific farmers handled by it. Having provided these farmers with the materials and means to carry out the improvements and innovations promoted by its extension staff, the ADU would recover the cost through the marketing of produce from the oil palm, rubber and cocoa areas on the farms served.

The existing extension service of the Department of Agriculture would continue to assist the farmers it serves through the existing subsidy schemes which are described in Supporting Report 2, Part III. These farmers would also still have available to them the credit facilities provided by shopkeeper-money-lender system which is so widespread throughout Sarawak.

### 3.4.3 Farm Budgets and Income of Public Sector Settlement Schemes

In Volume I, Chapter 3 the results of economic and financial evaluations of the agricultural developments started during the AP-period are given. It is shown that the development is economically viable.

This Section examines the returns to smallholders participating in the public sector settlement scheme initiated by SLDB and to workers employed directly by the SLDB on the nucleus estate. These returns are examined in greater detail in Supporting Report 2, Part II.

During 1973 a farm survey was organised in the Study Area by the Consultants. It indicated that the average potential net income of farmers in the traditional sector was about \$2,530 per year. Actual incomes, however, were much lower than this due to failure of crops in some seasons, poor performance of their rubber plots, and very low number of tapping days. Also over 60 per cent of the farm income was contributed by subsistence consumption items. Further information on household expenditure was derived from the 1967/68 Household Budget Survey which showed that the total average annual expenditure of the lower income group (\$0-\$300 per month) was \$1,944.

These data provided benchmarks against which incomes derived from future development could be gauged. For planning purposes the income requirements of smallholder families have been related to an earning potential based on the following:

- (i) Two potential full-time workers per family.
- (ii) An average 'take home' wage ranging from \$4.50 to \$5.00 per day.
- (iii) The average number of days worked in a year would be 285.

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

**(a) Smallholder Sub-scheme**

Farm sizes for smallholders were planned according to the following income criteria:

- (i) A minimum family income of \$2,500 by the sixth or seventh year from planting.
- (ii) 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.
- (iii) Provision for replanting funds to be set up during the productive life of the tree crops.

The actual acreages of the five types of smallholdings adopted in the agricultural plan have been given previously.

The revenues and costs on the smallholdings have been estimated in three distinct periods:

- (i) The development or investment period, (year 0 to 4).
- (ii) The production or repayment period.
- (iii) The post-repayment period.

**(b) Initial Development Costs**

Earlier Sections of this Chapter make it clear that during the initial development period the SLDB would be responsible for establishment 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 for the five farm types over the development period are summarised in Table 3.18. 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 cease and the ADU would take over.

The initial clearing, draining 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.

**TABLE 3.18 SMALLHOLDING DEVELOPMENT COSTS  
(YEARS 0-4)—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	11,683	22,891	23,050
Net Revenue from Sale Crops (Years 3 & 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

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 recovered. A payback period longer than 20 years is unlikely to be acceptable on social grounds and, due to the large interest element in repayments, 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.

In the post-repayment period, that is 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 crop 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 living standards, indicate the need for a fairly high income in this period.

Management costs have been charged on the basis that initially the management of the area would be under SLDB but ultimately the smallholders would be responsible 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:

- (i) 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 benefiting from them if the schemes are not to become an encumbrance on the rest of the agricultural economy.

(ii) 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 onwards	\$320 per holding

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 viewpoint. 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 was carried out to examine the effect of inflation on real interest costs. The rate of inflation was assumed to be five per cent in which case the real interest rate would be only two per cent to the smallholder.

A replanting levy has been considered necessary because the tree crops are expected 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-payment period to cover the costs of replanting when it becomes necessary. Examples of the annual costs per acre of crop calculated on a sinking fund basis, with interest at seven per cent, are as follows:

<i>Crop</i>	<i>Replanting Costs Discounted to Clearing Year (\$ per acre)</i>	<i>Number of years</i>	<i>Annual Cost \$ per acre</i>
Oil Palm	25	8 years	74
Rubber	30	13 years	64
Cocoa	30	13 years	61

### (c) Farm Incomes and Repayment Capacity

During the development period 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. These have been assessed as follows:

					<i>Homestead Plot</i>	<i>Rice Plot</i>
Year 2	...	...	...	...	\$100	\$180
Year 3	...	...	...	...	\$100	\$220
Year 4	...	...	...	...	\$200	\$275
Year 5	...	...	...	...	\$200	\$275
Year 6 onwards	...	...	...	...	\$300	\$275

The estimated average earnings for smallholder farmers during the development period are given in Table 3.19.

TABLE 3.19 ESTIMATED SMALLHOLDER INCOMES DURING THE FARM DEVELOPMENT PERIOD (\$ per year)

<i>Item</i>	<i>Earnings per year after clearing</i>			
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>
Wage earned per worker at \$5 per day ...	775	655	730	845
Average wages per family ... ..	1,550	1,310	1,460	1,690
Income from rice and homestead plots ...	nil	280	320	475
Total family income ... ..	1,550	1,590	1,780	2,165

Incomes during the repayment period, from the fifth year onwards, have been calculated as the surpluses remaining after allowing the following revenues and costs:

- the gross value of farm production, taken as the value of the total production of each crop at the f o b market prices presented earlier in this Chapter, less;
- 'ex-farm' costs of processing, duty, transport, and distribution of the products 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.

A summary of the farm budgets showing the net farm incomes and the settlers income (after deducting loan repayment costs) are shown, for the five holding types, in Table 3.40. The payback periods are shown in Table 3.21.

TABLE 3.20 SUMMARY OF SMALLHOLDER FARM BUDGETS

	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
<b>FARM TYPE 'a'</b>																					
Gross Farm Revenue ...	5,963	7,224	9,813	11,038	11,835	12,228	12,462	12,675	12,879	13,011	12,930	12,768	12,687	12,525	12,363	12,363	12,282	12,282	12,192	12,192	12,066
Total Costs ...	3,438	4,291	4,898	5,069	5,275	5,378	5,433	5,532	5,576	5,598	5,577	5,528	5,500	6,502	6,456	6,221	6,197	6,197	6,174	6,174	6,150
Net Farm Income ...	2,425	2,933	4,915	5,989	6,560	6,850	7,029	7,143	7,303	7,413	7,353	7,240	7,187	6,023	5,907	6,142	6,085	6,085	6,018	6,018	5,916
Loan Repayment ...	—	433	2,165	3,239	3,560	3,850	3,529	3,643	3,803	3,913	3,853	3,740	3,43	—	—	—	—	—	—	—	—
Settler Income ...	2,425	2,500	2,750	2,750	3,000	3,000	3,500	3,500	3,500	3,500	3,500	3,500	6,844	6,023	5,907	6,142	6,085	6,085	6,018	6,018	5,916
<b>FARM TYPE 'b'</b>																					
Gross Farm Revenue ...	6,560	7,950	10,320	11,385	12,045	12,350	12,545	12,700	12,845	12,910	12,820	12,640	12,550	12,370	12,190	12,190	12,100	12,100	12,000	12,000	11,860
Total Costs ...	3,791	4,527	5,089	5,252	5,428	5,513	5,559	5,635	5,665	5,670	5,647	5,592	6,477	6,424	6,371	6,136	6,111	6,111	6,084	6,084	6,058
Net Farm Income ...	2,769	3,423	5,231	6,133	6,617	6,837	6,986	7,065	7,180	7,240	7,173	7,048	6,073	5,946	5,819	6,054	5,989	5,989	5,916	5,916	5,802
Loan Repayment ...	269	923	2,481	3,383	3,617	3,837	3,486	3,565	3,680	3,740	3,673	2,508	—	—	—	—	—	—	—	—	—
Settler Income ...	2,800	2,500	2,750	2,750	3,000	3,000	3,500	3,500	3,500	3,500	3,500	4,540	6,073	5,946	5,819	6,054	5,989	5,989	5,916	5,916	5,802
<b>FARM TYPE 'c'</b>																					
Gross Farm Revenue ...	7,157	8,676	10,827	11,712	12,255	12,472	12,628	12,725	12,811	12,809	12,710	12,512	12,413	12,215	12,017	12,017	11,918	11,918	11,808	11,808	11,654
Total Costs ...	4,043	4,762	5,279	5,428	5,581	5,648	5,684	5,738	5,755	5,742	5,717	5,657	6,544	6,486	6,427	6,192	6,165	6,165	6,135	6,135	6,107
Net Farm Income ...	3,114	3,914	5,548	6,284	6,674	6,824	6,944	6,987	7,056	7,067	6,993	6,855	5,869	5,729	5,590	5,825	5,753	5,753	5,673	5,673	5,547
Loan Repayment ...	614	1,414	2,798	3,534	3,674	3,824	3,444	3,487	3,556	3,567	3,493	2,372	—	—	—	—	—	—	—	—	—
Settler Income ...	2,500	2,500	2,750	2,750	3,000	3,000	3,500	3,500	3,500	3,500	3,500	4,483	5,869	5,729	5,590	5,825	5,753	5,753	5,673	5,673	5,547
<b>FARM TYPE 'd'</b>																					
Gross Farm Revenue ...	8,560	10,950	11,800	11,910	11,960	11,780	11,870	11,870	11,680	11,500	11,410	11,230	11,140	10,960	10,780	10,780	10,690	10,690	10,590	10,590	10,450
Total Costs ...	4,331	4,984	5,220	5,282	5,364	5,316	5,316	5,291	5,264	5,212	5,845	5,790	5,802	5,707	5,654	5,419	5,394	5,394	5,367	5,367	5,341
Net Farm Income ...	4,329	5,966	6,580	6,628	6,596	6,554	6,554	6,489	6,416	6,288	5,565	5,440	5,338	5,253	5,126	5,361	5,296	5,296	5,223	5,223	5,109
Loan Repayment ...	1,829	3,466	3,830	3,878	3,596	3,554	3,054	2,989	2,916	2,189	—	—	—	—	—	—	—	—	—	—	—
Settler Income ...	2,500	2,500	2,750	2,750	3,000	3,000	3,500	3,500	3,500	4,099	5,565	5,440	5,338	5,253	5,126	5,361	5,296	5,296	5,223	5,223	5,109
<b>FARM TYPE 'e'</b>																					
Gross Farm Revenue ...	8,463	10,974	11,739	11,838	11,883	11,802	11,802	11,721	11,631	11,469	11,388	11,226	11,145	10,983	10,821	10,821	10,740	10,740	10,650	10,650	10,524
Total Costs ...	4,227	4,890	5,106	5,161	5,250	5,192	5,192	5,170	5,146	5,099	5,730	5,681	5,657	5,657	5,559	5,324	5,300	5,300	5,277	5,277	5,253
Net Farm Income ...	4,236	6,084	6,633	6,677	6,633	6,610	6,610	6,551	6,485	6,370	5,659	5,545	5,488	5,326	5,262	5,497	5,440	5,440	5,373	5,373	5,271
Loan Repayment ...	1,736	3,584	3,883	3,927	3,633	3,610	3,110	3,051	2,985	2,183	—	—	—	—	—	—	—	—	—	—	—
Settler Income ...	2,500	2,500	2,750	2,750	3,000	3,000	3,500	3,500	3,500	4,187	5,658	5,545	5,488	5,326	5,262	5,497	5,440	5,440	5,373	5,373	5,271

Two alternative situations were examined taking holding type (b) as an example:

- (i) a 20 per cent increase in rubber prices, the effect of which would be:
  - the repayment capacity of the holding would be increased and the payback period would be slightly shorter, 15 years instead of 16;
  - net farm income during the post-repayment period would be increased by some 16 per cent;
- (ii) a reduced real interest rate from seven per cent to two per cent per year. This would reduce the payback period to 13 years.

(d) **SLDB Nucleus Estate**

Three sub-schemes are proposed to make up the nucleus estate in the Niah-Suai RDA during the AP-period. Analyses were made aimed at showing:

- the income workers would receive from wage employment on the estate;
- the potential incomes of workers if the schemes were organised on a group participation basis;
- the capacity of the schemes to pay back the development cost involved in their establishment under normal wage employment and if profit sharing were introduced.

**TABLE 3.21 REPAYMENT CAPACITY OF SMALLHOLDINGS**

Holding Type	Accumulated Capital Sum <sup>(1)</sup> at Start of Repayment	Payback 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

(1) Including funded interest at seven per cent.

The sub-schemes have the following cropping patterns:

Sub-scheme	Net Acres of Crops Planted			
	Oil Palm	Rubber	Cocoa	Total
Igang	3,245	370	nil	3,615
Sawai	2,620	645	270	3,535
Jatan	5,320	770	450	6,540
Total:	11,185	1,785	720	13,690
Per cent of Total Area:	82	13	5	100

The plan provides for the workers to be accommodated in the central town, Igang, with the maximum distance of about 6.5 miles to any point of the estate. The number of workers/settlers employed would be related to the labour requirements of the crops planted which would vary according to the stage of each crop, for planning purposes they have been taken as follows:

Oil palms	1 worker per 11 acres
Rubber	1 worker per 6 acres
Cocoa	1 worker for 10 acres

Allowance has also been made for part-time employment. On these assumptions the estimated numbers of workers and families associated with the schemes would be:

<i>Sub-scheme</i>	<i>Number of Workers Required</i>	<i>Number of families Accommodated</i>
Igang	356	220
Sawai	372	222
Jatan	657	403
<b>Total:</b>	<b>1,385</b>	<b>845</b>

Workers have been assumed to receive \$5.00 per day and that the employment created by the crops on the scheme would be equally available to all workers. The actual numbers employed at any time would vary with the work load on the schemes. There are likely to be seasonal labour peaks in oil palm largely due to the seasonal fruiting. Similar labour peaks occur in rubber production. Therefore some workers would be seasonally employed as indicated previously.

The average earnings per family, calculated from the annual expenditures on labour wages for crop production, are given in Table 3.22.

The average level of earnings would not reach the desired minimum of \$2,500 per year. There appears little chance of decreasing the number of families on each sub-scheme, thereby increasing earnings per family, due to the limitation of physical capacity of workers to deal with more than the indicated acres of crops.

The possibility of increasing incomes by a profit sharing system was investigated. SLDB at present operates a scheme whereby workers receive a \$1.00 per day bonus if they work more than 20 days per month. If a similar bonus were applied to the earnings shown in Table 3.22 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 average income would be \$2,485. In addition water and other services could be provided free and this would raise incomes to a satisfactory level.

The effect of the schemes being organised on a group participation basis was examined. The basis for the organisation envisaged was:

- Settlers to participate in groups with 20 to 30 members.
- Scheme crop areas to be divided amongst groups according to the number of participants.

TABLE 3.22 WAGE EMPLOYMENT INCOMES ON THE SLDB NUCLEUS ESTATES

Item	Scheme Year after Clearing											
	2	3	4	5	6	7	8	9	10-16	17 onwards		
<i>Igang Sub-scheme</i>												
Total Wage 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
<i>Sawai Sub-scheme</i>												
Total Wage 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
<i>Jatan Sub-scheme</i>												
Total Wage 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

- Overall management to be retained by SLDB.
- House ownership provided on an individual or group basis.
- Groups formed in fifth year of the scheme.
- Development costs including labour and management up to the formation of the groups to be recovered by a consolidated charge calculated on a per acre basis aimed at recovering those costs together with funded interest within 20 years.
- Settlers to receive an income of \$2,500 to \$3,000 per family.

The Jatan sub-scheme was analysed as an example. It was shown that the participants would receive an increase of between \$1 and \$2 per day which would make their annual income satisfactory.

Calculations were also made to examine the payback period of the sub-schemes under the three wage-payment systems.

The results are summarised in Table 3.23. If wages only were to be paid to workers at \$5 per day the payback period of all three sub-schemes would be close to, or less than, the 20 years considered desirable. Under a profit sharing system the payback period would be longer but still within the productive life of the tree crops. Under the group participation scheme the payback period would be longer but still acceptable.

TABLE 3.23 REPAYMENT CAPACITIES OF SLDB SUB-SCHEMES UNDER DIFFERENT WAGE PAYMENT SYSTEMS

<i>Wage Payment System</i>	<i>Sub-scheme</i>	<i>Accumulated Deficit Including Interest \$ mn</i>	<i>Payback Period from Clearing Year (years)</i>
<i>Paid Labour</i>			
at \$5 per day	Igang	7.6	17
	Sawai	7.5	20
	Jatan	13.7	19
<i>Profit Sharing</i>			
(a) Bonus of \$1 per day	Jatan	14.5	21
(b) Bonus of \$2 per day	Jatan	15.5	25+
<i>Group Participation</i>			
(a) Including housing	Jatan	15.7	25+
(b) Excluding housing	Jatan	11.9	22

## CHAPTER 4

### FORESTRY AND CONSERVATION

These two subjects are included in the same chapter because they have much in common, but each is covered in more detail separately in Supporting Report 3.

#### 4.1 FORESTRY

##### 4.1.1 Introduction

The Scope of Work required the Consultants to develop a broad land-use classification of the Study Area "with major emphasis on agriculture and forestry", and "giving particular attention to the zonation between forestry and other land uses and to the phasing of forest exploitation with land development". Processing of timber should be done within the Region as much as possible, and attention was drawn to the studies recently undertaken by the UNDP/FAO Team in regard to utilisation and forest development generally.

##### 4.1.2 Present Forestry

Hitherto forest policy as applied to the Fourth Division has been primarily protective in its scope. Large areas of virgin forest have been safeguarded in Forest Reserves and Protected Forests, covering between them about 38 per cent of the Region. Such forest utilisation as has taken place has been mainly outside these areas, much of it on land which was intended to be developed subsequently largely for agriculture, although at that stage no investigation had been made as to its suitability for that purpose.

The forests of the Division fall into two broad types; Peat Swamp Forests and Dryland Forests, the latter being virtually synonymous with Mixed Dipterocarp Forest. The distribution of these main types throughout the Region is shown in Figure 1.1.

The Peat Swamp Forests cover some 687,000 acres, of which approximately half are in reserves. The environment is highly specialised on flat, wet land near the coast and extending inland along the major rivers. Their location makes these forests the most easily accessible, and they have generally been the first and most extensively utilised.

In the Fourth Division the whole area of swamp forest has either been exploited or is currently under licence. Utilisation has been largely limited to logs for export, with a heavy concentration on ramin (*Gonystylus bancanus*). This species has been found not to regenerate satisfactorily and the supplies throughout the whole State cannot be sustained. Research into regeneration methods and the wider use of the two other common peat swamp species, alan (*Shorea albida*) and jongkong (*Dactylocladus stenostachys*), which do regenerate naturally, is being undertaken.

The Mixed Dipterocarp Forests cover approximately 2,156,000 acres (77 per cent of the present total area of forests), spread over a varied terrain of steep and undulating land up to about 4,000 feet above sea level. The botanical composition of the forests is extremely complex, and the great diversity of trees makes profitable working difficult; but over 80 important commercial timber species have been listed.

Exploitation of these valuable forests started relatively recently and has been confined with one exception (Niah Forest Reserve) to areas outside the reserved and protected forests. Here again the produce has been mainly exported in log form. Market limitations, inadequate equipment, difficulties of access and transport, and problems of managerial control have all resulted in very selective felling. Much valuable timber has been left and it has been estimated that only about two-thirds of the potential net commercial volume, assessed at an overall average of 16 tons hoppus per acre, has been extracted. Moreover, because exploitation tends to be near rivers and roads, where settlements also occur, the residual timber is often totally destroyed in subsequent illegal occupation aided by access along logging tracks.

The total production of timber in recent years from the Study Area, and its value based on export prices, is shown in Table 4.1.

TABLE 4.1 TOTAL PRODUCTION OF TIMBER FROM THE STUDY AREA

Year	Production (tons, hoppus)	Export Value \$ mn
1971	793,475	566
1972	738,595	449

More than 80 per cent of the production was exported in round logs. In 1973 the volume of production increased and prices rose so that the total value of production is expected to have doubled in that year. The growth of local processing industries will have reduced the proportion exported as logs but, on the present basis, the harvesting of Mixed Dipterocarp Forest in existing licensed State Land areas will be completed in five or six years.

Still part of the present picture, but of the greatest significance for the future, are the results and recommendations of the UNDP/FAO Forest Industry Team which has been working in Sarawak and Peninsular Malaysia during the past three and a half years. An inventory was made of the main Mixed Dipterocarp Forest Reserves and Protected Forests, covering about 630,000 acres in the Study Area. The data collected classified more than two-thirds of this area as high volume density forest and estimated the overall average net commercial volume at over 1,000 cubic feet per acre (16 tons hoppus).

On the basis of these data the UNDP/FAO Team prepared plans for the systematic exploitation of the forests studied. These plans, in outline, recommended the establishment of three industrial timber complexes, each comprising a large unit area of forest feeding a modern sawmill and processing plants within the Region.\* Figure 4.1 shows the location of the three unit areas and the approximate sites of the industrial complexes. The prospect of a port, or alternative export facilities, near Bintulu is of dominant importance in the industrialization and is a key to the full realisation of the forest plans.

The aim of this timber industry would be to remove all trees over 18 inches diameter containing commercial wood, using both high and low quality logs, and gradually phasing down the export of round logs as domestic processing

\* A fourth complex, located at Long Lama, was recommended to work forest areas outside the Study Area.

expanded. The UNDP/FAO Team considered that the unit areas "appeared to have the capacity, subject to a suitable management regime, to maintain log intake requirements . . . on a sustained yield basis". Much investigational work and the improvement of technical and managerial skills would be needed; but in the meantime a post virgin harvesting period of 25 years was recommended. This period has the seemingly over-riding advantage of allowing sufficient log outturn for each of the complexes for 25 years. It is said by FAO to be justified by Peninsular Malaysian research data; but that research is not published. The matter is put in better perspective by a further UNDP/FAO quotation "No local basis exists for any regime of sustained yield management within the mixed Dipterocarp forests which form the resource base for the new industries". There is indeed little if any practical evidence in favour of polycyclic fellings in tropical rainforest anywhere in the world. Hence the emphasis on research, the alteration of terminology from felling cycle to harvesting period and the need for the Rejang forests, located to the south of the Study Area, to continue supplies to the complexes if the initial harvesting period has to be lengthened.

A summary of the FAO/UNDP working paper (1973b) appears in Supporting Report 3. The findings are generally accepted because they are based on detailed surveys of markets and resources which have not been included in the Miri-Bintulu Study. Furthermore actual licence negotiations are already in progress so that studies in greater detail would have had little more than theoretical interest.

The FAO/UNDP logging programmes are, of course, affected by the agricultural development plans. Figures 4.2, 4.3 and 4.4 show comparisons between the original and amended units and period boundaries. Figures 4.5, 4.6 and 4.7 show only the amended boundaries and their association with future agricultural allocations. How the amended acreages in the flow charts of Supporting Report 3 compare with UNDP/FAO plans is shown in Table 4.2. The new logging schedule is shown in Table 4.3.

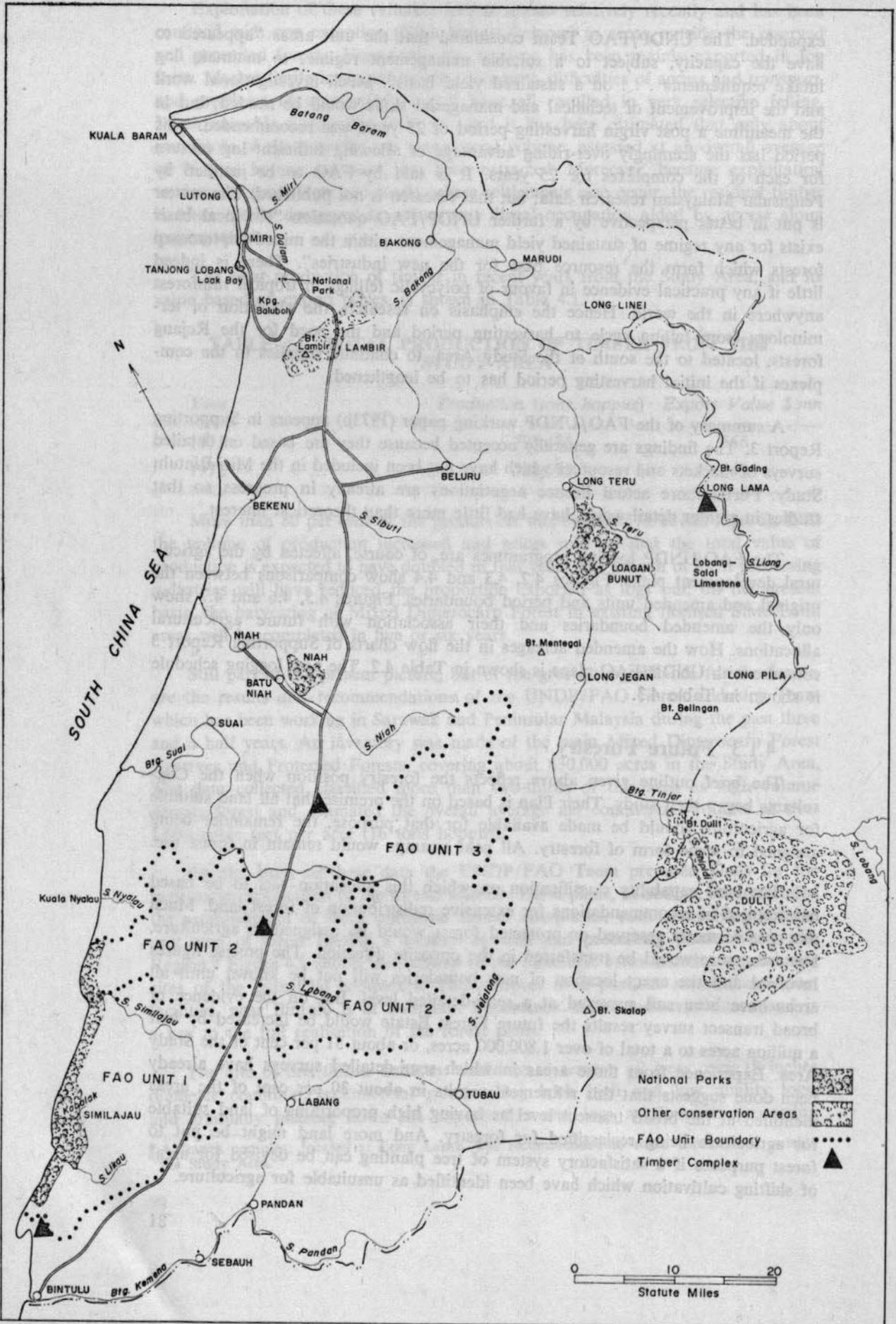
#### 4.1.3 Future Forestry

The brief outline given above reflects the forestry position when the Consultants began their study. Their Plan is based on the premise that all land suitable for agriculture should be made available for that purpose, the remainder being assigned to some form of forestry. All peat swamps would remain in forest use.

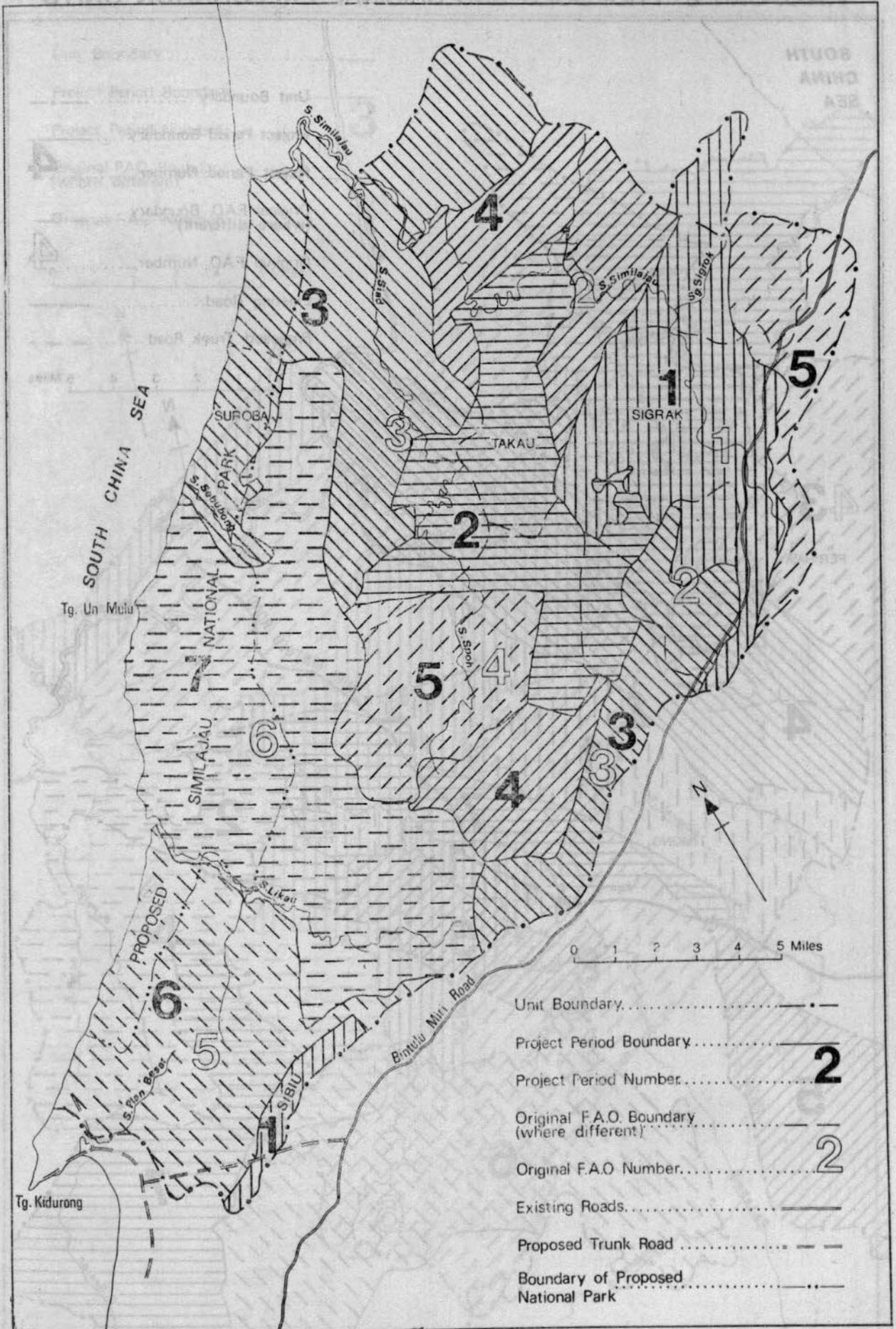
The land capability classification on which this allocation was to be based has resulted in recommendations for extensive redistribution of forest land. Much that was formerly reserved or protected forest would be assigned to agriculture, but even more would be transferred in the opposite direction. The precise figures involved and the exact location of new boundaries will not be known until all areas have been soil surveyed at a semi-detailed level. But on the evidence of broad transect survey results the future Forest Estate would be increased by half a million acres to a total of over 1,800,000 acres, or about 51 per cent of the Study Area. Experience from those areas in which semi-detailed surveys have already been done suggests that this refinement results in about 30 per cent of the areas identified at the broad transect level as having high proportions of land suitable for agriculture being reclassified for forestry. And more land might be put to forest purposes if a satisfactory system of tree planting can be devised for areas of shifting cultivation which have been identified as unsuitable for agriculture.

# PROPOSED FOREST INDUSTRIAL COMPLEXES

FIGURE 4.1

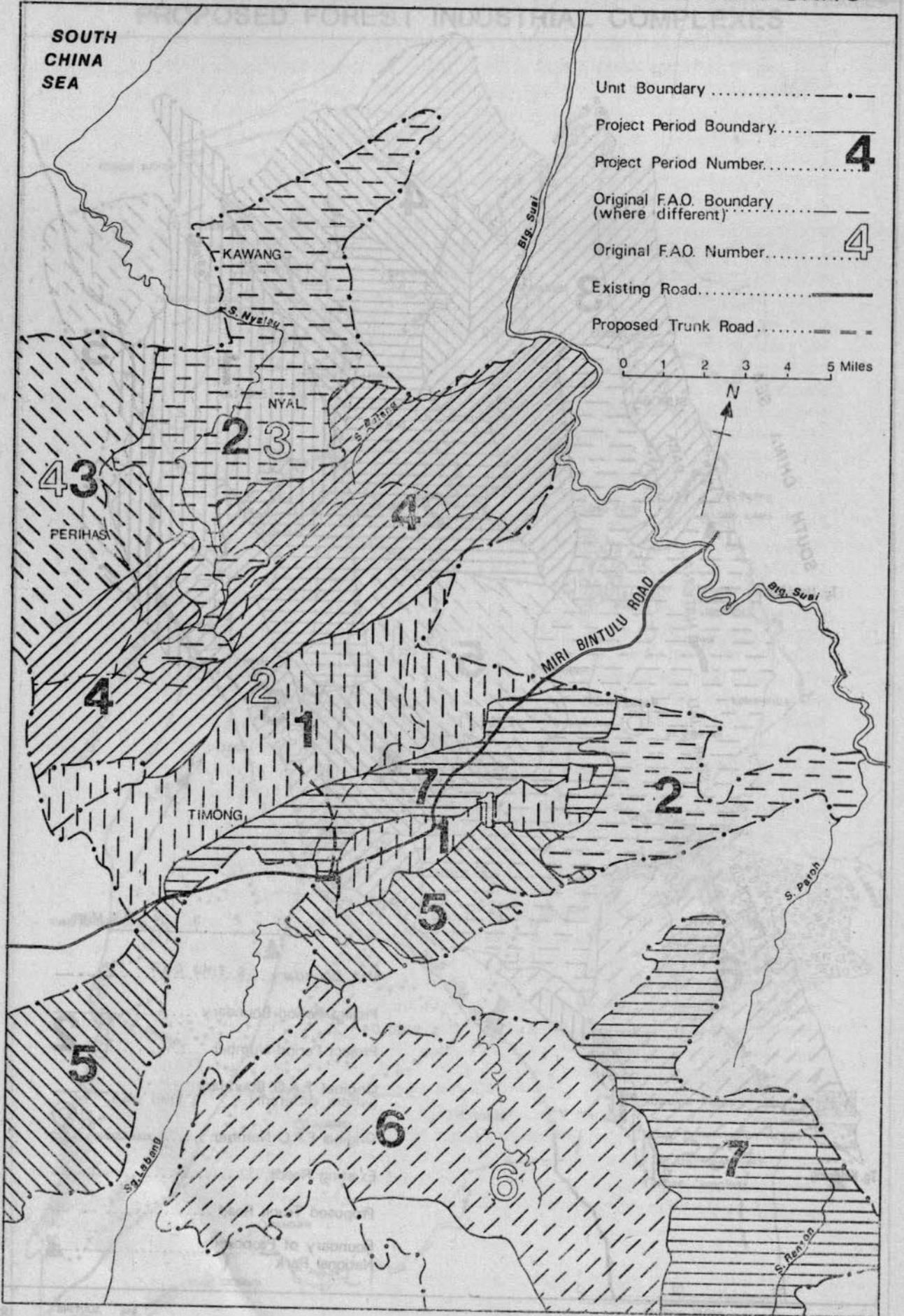


F.A.O. UNIT 1-PROPOSED AND ORIGINAL EXPLOITATION UNITS

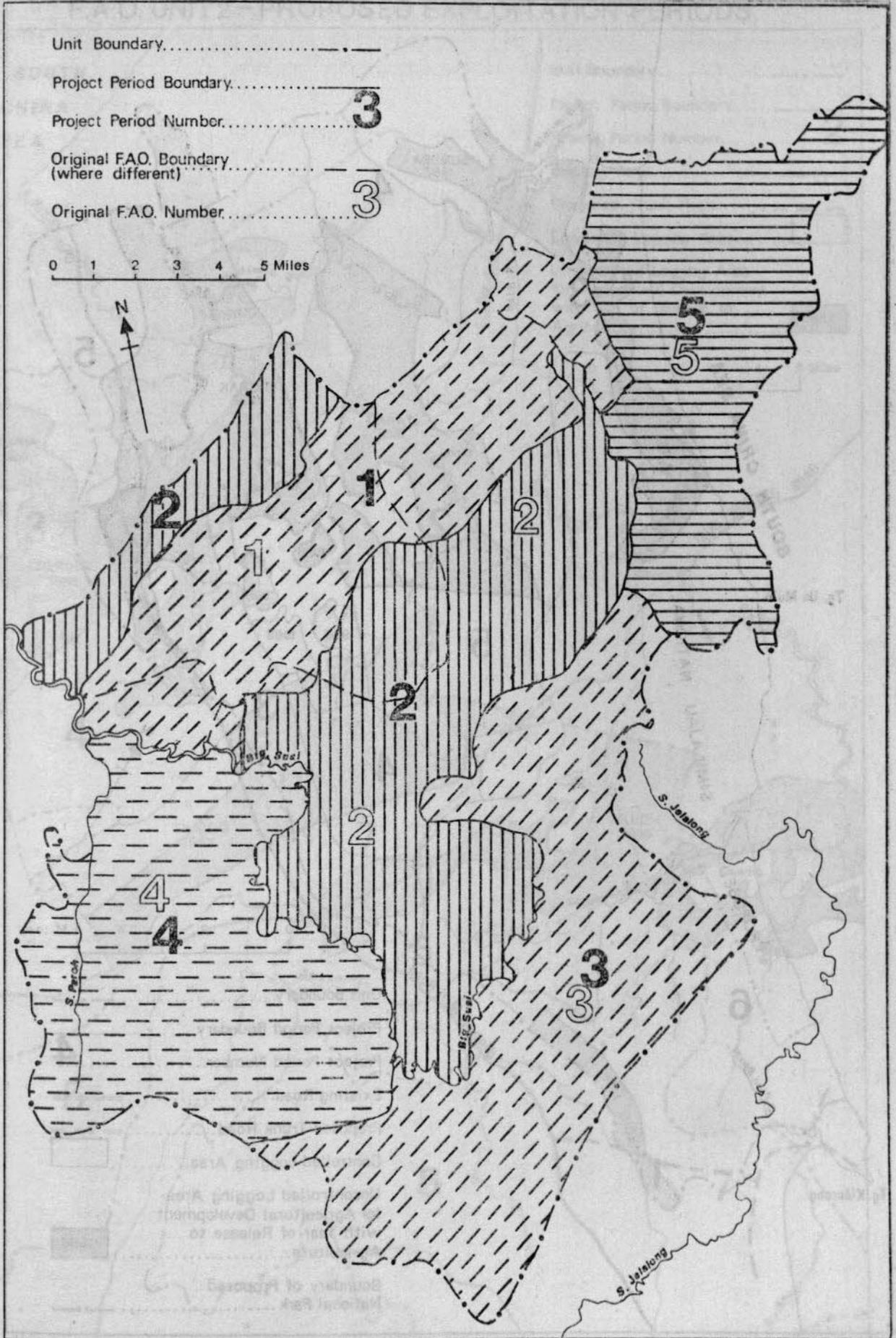


F.A.O. UNIT 2-PROPOSED AND ORIGINAL EXPLOITATION UNITS

FIGURE 4:3

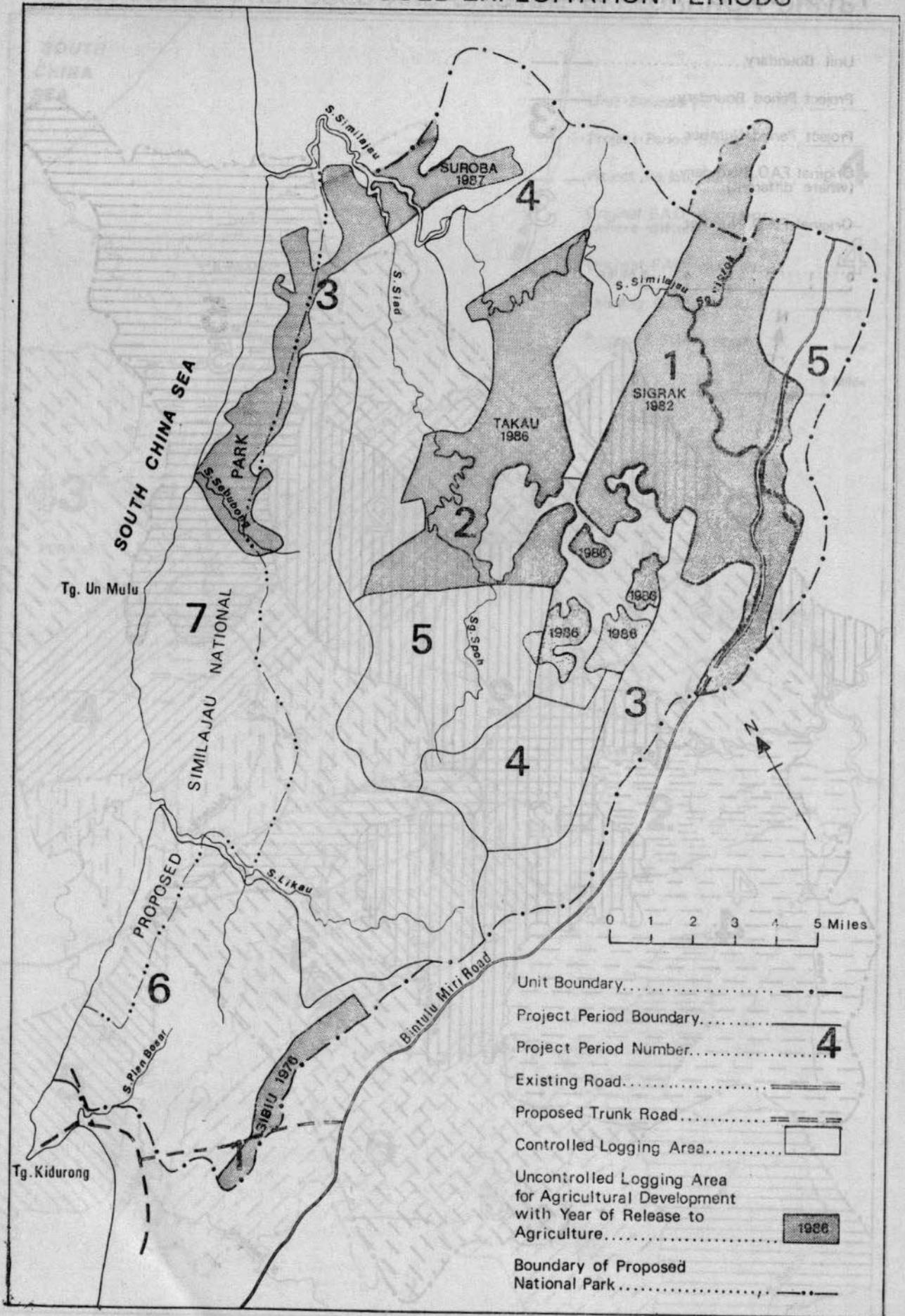


# F.A.O. UNIT 3 - PROPOSED AND ORIGINAL EXPLOITATION UNITS

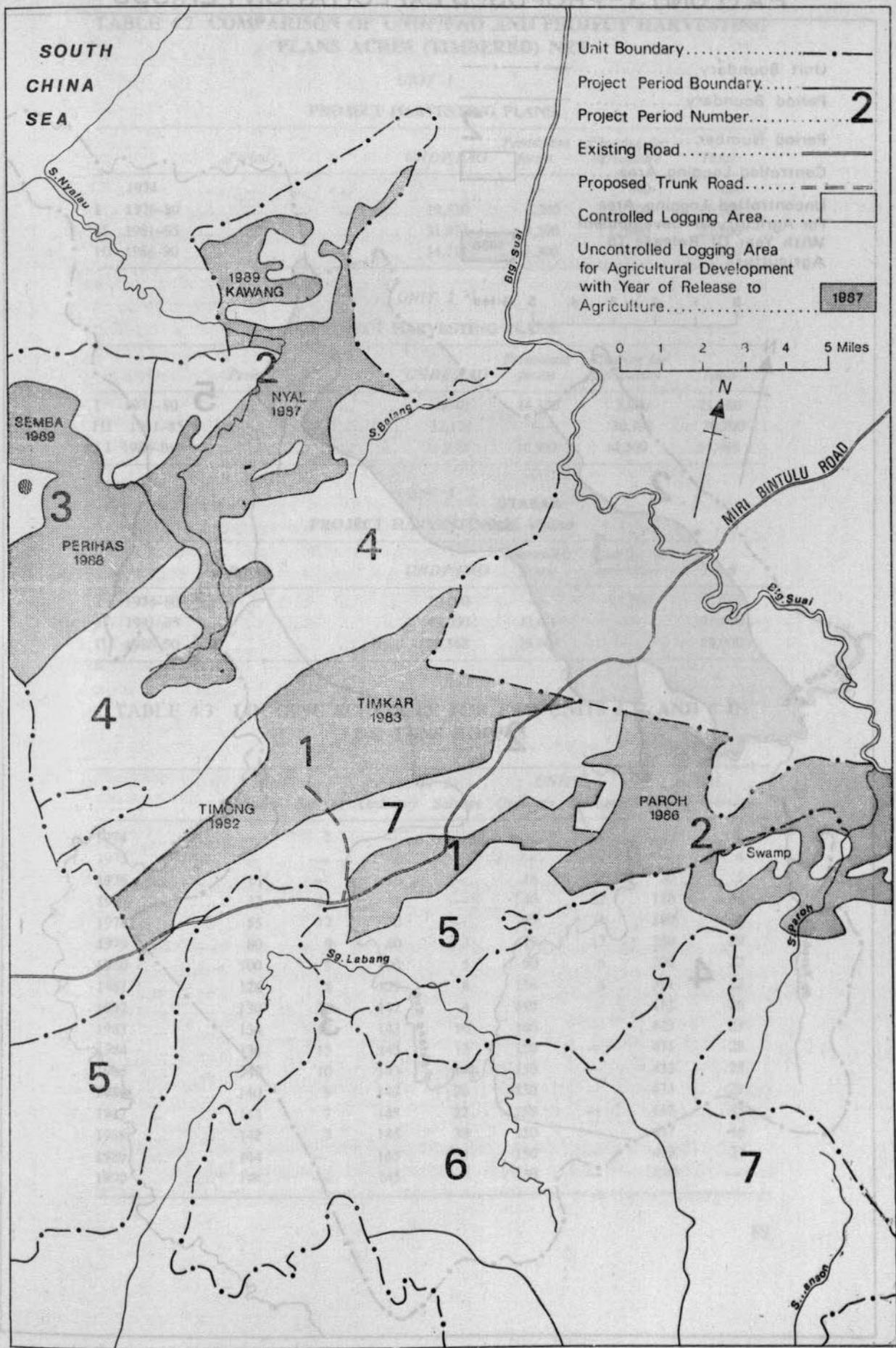


# F.A.O. UNIT 1 - PROPOSED EXPLOITATION PERIODS

FIGURE 45

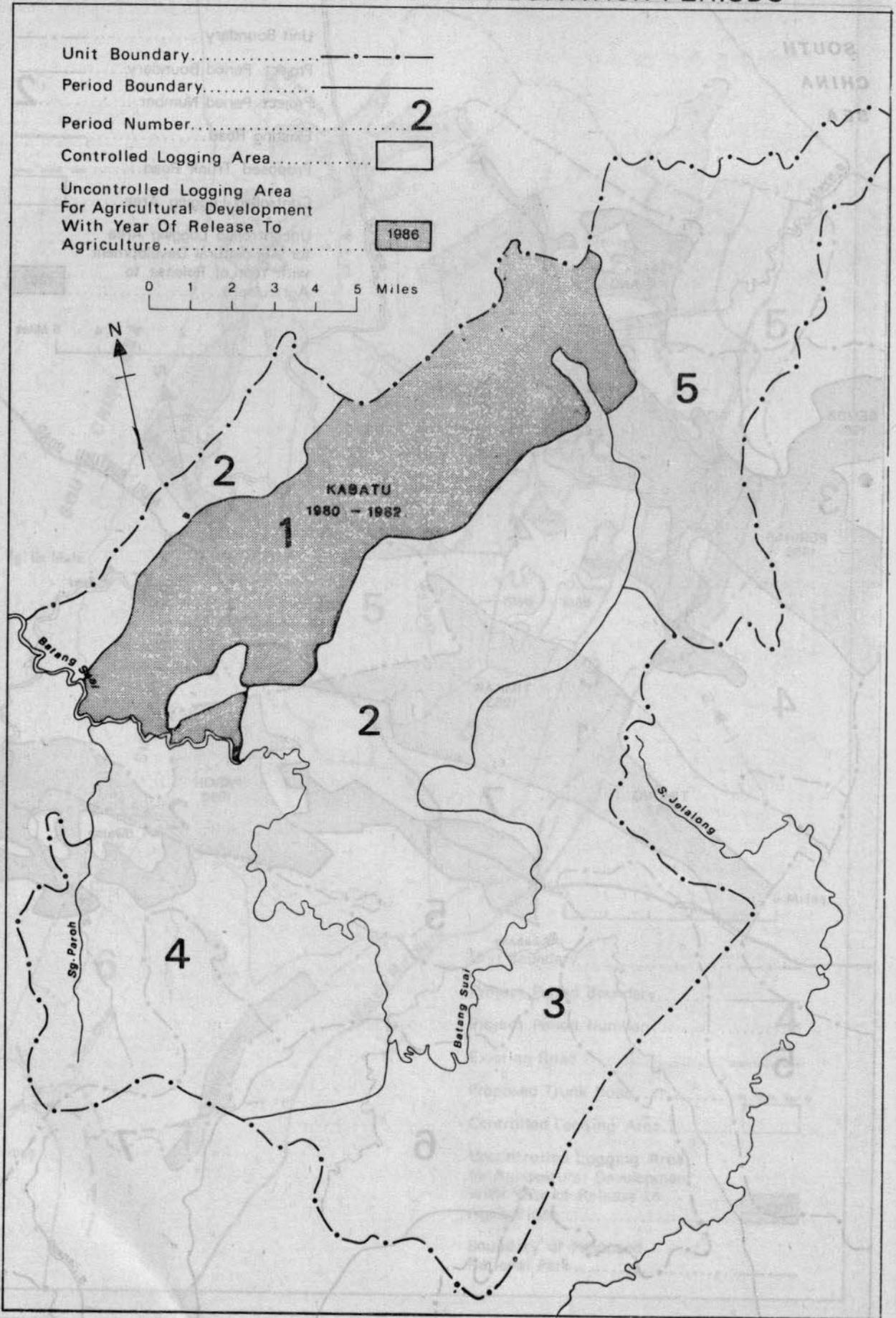


F.A.O. UNIT 2 - PROPOSED EXPLOITATION PERIODS



# F.A.O. UNIT 3 - PROPOSED EXPLOITATION PERIODS

FIGURE 4.7



**TABLE 4.2 COMPARISON OF UNDP/FAO AND PROJECT HARVESTING PLANS ACRES (TIMBERED) NET**

*UNIT 1*

**PROJECT HARVESTING PLANS**

	<i>Period</i>				<i>UNDP/FAO</i>	<i>Permanent forest</i>	<i>Clearing for agriculture</i>	<i>Total</i>
1974	...	...	...	...	—	—	600	600
I 1976-80	...	...	...	...	19,530	6,200	13,800	20,000
II 1981-85	...	...	...	...	31,973	9,300	17,900	27,200
III 1986-90	...	...	...	...	34,711	31,300	—	31,300

*UNIT 2*

**PROJECT HARVESTING PLANS**

	<i>Period</i>				<i>UNDP/FAO</i>	<i>Permanent forest</i>	<i>Clearing for agriculture</i>	<i>Total</i>
I 1976-80	...	...	...	...	21,040	14,100	7,000	21,100
III 1981-85	...	...	...	...	32,129	—	30,700	30,700
II 1986-90	...	...	...	...	36,939	16,900	14,500	31,400

*UNIT 3*

**PROJECT HARVESTING PLANS**

	<i>Period</i>				<i>UNDP/FAO</i>	<i>Permanent forest</i>	<i>Clearing for agriculture</i>	<i>Total</i>
I 1976-80	...	...	...	...	20,000	—	21,500	21,500
II 1981-85	...	...	...	...	45,000	43,000	—	43,000
III 1986-90	...	...	...	...	30,568	29,000	—	29,000

**TABLE 4.3 LOGGING SCHEDULE FOR FAO UNITS 1, 2 AND 3 IN 1,000 TONS HOPPUS**

	<i>UNIT 1</i>		<i>UNIT 2</i>		<i>UNIT 3</i>		<i>TOTAL</i>		
	<i>Ordinary</i>	<i>Salvage</i>	<i>Ordinary</i>	<i>Salvage</i>	<i>Ordinary</i>	<i>Salvage</i>	<i>Ordinary</i>	<i>Salvage</i>	
1974	...	...	—	2	—	—	—	—	2
1975	...	...	—	—	—	—	4	—	4
1976	...	...	16	—	16	—	18	5	50
1977	...	...	32	16	38	—	40	22	110
1978	...	...	55	12	70	—	55	34	180
1979	...	...	80	9	80	3	70	17	230
1980	...	...	100	8	100	5	90	9	290
1981	...	...	126	8	129	8	136	6	391
1982	...	...	130	22	142	4	140	—	412
1983	...	...	134	18	143	10	146	—	423
1984	...	...	138	15	143	13	150	—	431
1985	...	...	140	10	143	18	150	—	433
1986	...	...	140	8	143	20	150	—	433
1987	...	...	142	7	145	22	150	—	437
1988	...	...	142	7	145	39	150	—	437
1989	...	...	144	—	145	23	150	—	439
1990	...	...	144	—	145	—	150	—	439

The reallocation of land would involve the incorporation into the Forest Estate of some discarded, logged land unsuited to farming of any kind. Before the full implications for forestry of this adjustment could be adequately assessed, appraisal of the regeneration prospects of typical logged Mixed Dipterocarp Forests was clearly necessary. A diagnostic sample survey was therefore designed by the Consultants and the Forest Department covering all sizable areas involved, aggregating nearly 80,000 acres. The work was carried out by the Forest Department with the conclusion that there was sufficient regeneration and old growth stems for a second timber crop without the need for enrichment.

This was reassuring: it meant that in addition to an increase in the total area of the Forest Estate, the potential forest quality of much of the new land to be acquired by it was satisfactory. Moreover, the forest contribution to the conservation of the region would be immeasurably enhanced by giving permanent protection to all river catchment areas and those types of terrain more susceptible to natural erosion and to the deprecation of shifting cultivators. Although future changes in land use practices might cause minor alterations in land use classification and extend the possibilities of certain forms of agriculture, nevertheless it may now be said with confidence that a Forest Estate, disposed in accordance with the classification criteria used in the Study, could look forward to the permanent status so essential for long-term planning and good management.

In the Consultants' Plan the exploitation of Mixed Dipterocarp Forest will, for the next 20 years, be co-ordinated with agricultural development, requiring the closest co-operation between all concerned in both fields and in a number of activities. In the first place it will clearly be necessary to remove all marketable timber from land destined for agriculture in time to allow the whole process of land clearing, planting and settlement to follow a pre-determined programme. The degree of forest exploitation will vary with the content of the forest, with market demand and local processing capability; but a prime consideration must be to reduce waste as far as possible. The need for increased technical and market research in this connection is discussed later.

Basically there will be three types of forest harvesting:

- (i) Salvage logging on land already logged for export and intended for agricultural development.
- (ii) Maximum commercial logging for industry without silvicultural controls in virgin forest destined for agriculture.
- (iii) Maximum commercial logging compatible with silvicultural controls in areas to remain as permanent forest.

To enable forestry and agricultural authorities to plan and to proceed with their respective roles in their different areas, the timely demarcation of boundaries between permanent forest and agricultural land is essential. The task is formidable; something like 800 miles of new boundary line will require fresh survey. Those boundaries associated with planned agricultural development amount to over 700 miles (see Chapter 3 and Supporting Report 2 Part II). However, boundaries cannot be aligned in their final position until semi-detailed soil surveys have shown precisely where they should be.

The Plan provides, of course, that agricultural development should begin where semi-detailed surveys have already determined the boundaries, but the pace of development proposed is such that the present soil survey capacity will be severely

taxed with the work required to clarify boundaries in substantial areas programmed for forest exploitation in 1976/7. Alternative procedures must, therefore, be considered. In one the boundaries could be demarcated approximately on the present broad transect classification alignment and silvicultural controls and experiments limited to land presumed to be permanent forest. This would result in a certain amount of permanent forest, possibly as much as 30 per cent of any land block chosen for semi-detailed soil survey, lacking proper silvicultural controls. In the second alternative logging could 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 survey. Both these temporary expedients have disadvantages precluding adoption except as a last resort.

The commercial basis of the plans for exploiting the three big forest industry units proposed by UNDP/FAO is to divide each into development phases to provide a steady annual production over 25 years. The phases have been modified in conjunction with the FAO Team to conform with the requirements of planned systematic agricultural development. However, to obtain a greater flexibility it is hoped that it will be possible to operate the complexes on a lower annual throughput, thus lengthening the first exploitation period.

The phases are so located that exploitation would start from an accessible road base and work out from it. But, as already mentioned, the first areas for agricultural development—the Priority Areas—have as far as possible been located in land already logged. Thus salvage logging will be the rule, and this will allow more time to establish the industrial processing plants before the higher output phases of the UNDP/FAO Units destined for agriculture have to be harvested.

For efficient harvesting a properly planned system of access and extraction roads will be essential. In areas destined for agriculture it is proposed that, before logging begins, the major roads be built in their permanent alignment by Government (or under Government supervision) to PWD Standards. This would assist expeditious logging and extraction, but it requires a carefully co-ordinated construction programme to ensure that forest harvesting is not prejudiced. Subsidiary logging roads in agricultural areas, and the entire road system in permanent forest areas, would be built by concession licencees in accordance with plans submitted to the Forest Department well in advance. The object is to ensure the correct alignment of roads to facilitate efficient extraction and, at the same time reduce the loss of soil and the silting of streams that can reach alarming proportions with faulty practices on a large scale.

The Government has set up the Sarawak Timber Industry Development Corporation to implement the UNDP/FAO proposals subject, no doubt, to any modifications the Government may make in the light of the Consultants' recommendations. The Corporation will work in close conjunction with the Forest Department, who will continue to be responsible for forest policy, logging levels and the general maintenance of the Forest Estate.

The sawmills and timber processing plants to be set up under the Corporation will be among the first big industrial enterprises to be developed in the Region. They would therefore have considerable impact on the general development of industry wherever they were established. Recommendations have been made in Supporting Report 5 integrating the industrial complexes into the overall Regional Plan.

#### 4.1.4 Forest Research and Administration

The extension of commercial forestry from the Peat Swamp Forests into large scale utilisation of the Mixed Dipterocarps creates an urgent need for further knowledge in several branches of forestry. As far as silvicultural treatment of permanent forests is concerned this need was foreseen, and a comprehensive research programme was worked out by Dr. H. C. Dawkins of the Commonwealth Forestry Institute in conjunction with the Forest Department. Of special significance for the Study Area are the investigations relating to silvicultural practices in the harvesting of Mixed Dipterocarp Forests. These include studies of growth rates, poisoning unwanted stems and the enrichment of natural regeneration. But probably the most important research item is to devise a method of recurrent inventory to monitor the regeneration progress in logged forest. It is unfortunate that a recently started series of research plots designed to investigate these important aspects have been sited in the Niah Forest Reserve, near Bukit Igang, on land ideally suitable for locating a sub-regional urban centre. This conflict of interests is further briefly discussed in Chapter 6 and fully presented in Supporting Reports 2, 3 and 5. Research plot 68 should be retained with adequate surrounds (0.5 mile) in spite of the inclusion of some land suitable for agriculture. Other plots should be confined to land unsuitable for agriculture.

Sarawak Forest Department policy now recognises the need to go deeper into the prospects and problems of establishing plantations of fast-growing species, possibly for the large scale production of industrial cellulose, on deforested land. However, the whole concept needs to be looked at in the light of accumulating knowledge on natural regeneration in logged forest; but research work has already begun to test promising tree species, and a further facet of the subject is now recommended for study. This refers to the possible reforestation of Native Customary Land which is unsuitable for agricultural development. Socio-economic research should be done to assess the prospects of converting shifting hill rice cultivators on such land into forest farmers by getting them to plant and manage suitable tree species. The suggestion has been made that for these plantations the taungya system could be used in a similar manner to that explained in Chapter 3 for establishing oil palm and rubber. Hopes should not be raised unduly however because, as pointed out in Supporting Report 3, there are contra-indications one of which erosion, has been found to be so great a hazard in pine plantations on steep land in Peninsular Malaysia as to preclude the use of such land for the purpose.

As regards polycyclic felling research there are three important considerations often overlooked. First, in converting natural forest to managed forest the first planned post virgin harvesting period can only be hypothetically regarded as the beginning of a cycle. At the end of the harvesting period prudence demands that there should still be available areas of accessible virgin forest which could be used to sustain the yield if the first previously harvested areas are not sufficiently regenerated. Secondly the number of replications should always be sufficient to enable valid statistical analysis to be undertaken, and thirdly the differences between treatments must be wide.

In addition to research into production aspects of forestry, the UNDP/FAO Team have proposed a comprehensive expansion of the present programme of research into utilisation of markets to pave the way for the major timber industry complexes. No doubt this will be carried out by the Corporation in conjunction with the Forest Industries Development Research Unit.

The Consultants strongly support this entire research programme. But research is only one of the fields in which new strength is needed. The enormous expansion of activity throughout the whole forest enterprise as part of Fourth Division development cannot be undertaken without a corresponding expansion of the Forest Department in all its branches. The Department has already put forward a comprehensive expansion programme which the Consultants believe to be eminently sound.

#### 4.1.5 Forest Economics

It will be evident, from the outline already given of the various levels of forest harvesting in different categories of forest, that both the output of forest produce and the cost of production will vary in each case.

In the summary economic analysis that follows, the price of timber over the next seven years is assumed to vary from \$70 per ton of peat swamp forest logs to \$105 per ton of Mixed Dipterocarp logs. It is also assumed that the salvage logging of remnant forest on existing licenced areas will yield a further four tons hoppus per acre. On these assumptions and on the basis of the Plan the total estimated volume and value of logs that will be extracted in the Study Area up to 1980 would be:

	1974	1975	1976	1977	1978	1979	1980
In 1,000 tons hoppus	987	995	1,000	1,060	1,025	930	870
In mn dollars	91.3	92.2	93.0	99.0	95.9	86.9	81.3

Logging operations will differ in different categories of forest and costs will vary accordingly. Existing licenced areas will continue to be logged in the traditional way, whereas the new industrial units will warrant large scale equipment, with a higher investment in roads and extraction machinery. Traditional logging costs are estimated at \$45 per ton hoppus in unlogged mixed hill Dipterocarp areas, and between \$35 and \$40 in remnant forest, i.e. salvage operations. The cost estimate in the big industrial units is \$40 per ton hoppus. The extraction costs in peat swamp forest areas are estimated at \$25 per ton hoppus.

To these logging costs should be added the expense of silvicultural treatment in the areas remaining under permanent forest. This treatment, calculated at \$38 per acre, based on Peninsular Malaysia experience, can reasonably be added to the costs of first extraction, increasing the latter by \$2 to \$3 per ton hoppus.

The net revenue, before deduction of taxes and royalties from the total forest produce of the Study Area would be:

	1974	1975	1976	1977	1978	1979	1980
In mn dollars	52.0	52.6	53.3	57.1	55.7	50.7	47.8

If the present policy for the payment of royalties is continued, this output would yield about \$10 mn in royalties per year during 1975 to 1980.

An estimate of the forest sector's contribution to the Regional economy can be expressed as the total production value in the sector. This value is calculated by deducting from the gross value (or product value) of logging such inputs as originate externally—fuel, machinery, trade margins, external transport, etc. Thus the production value would be:

	1974	1975	1976	1977	1978	1979	1980
In mn dollars	68.1	68.7	69.5	74.7	73.0	66.9	65.8

The entire economic evaluation for the forest industry is based on the present position and planned development. Results from research programmes and the wider use of timber not now merchantable could greatly increase the economic importance of the future Forest Estate in the Study Area.

## 4.2 CONSERVATION

### 4.2.1 The Impact of Development

This section is concerned with conservation in its fullest sense; not only with the physical resources of the area immediately threatened by development, but with the biological and environmental resources which have a much wider, long-term significance.

The development plans as a whole, being based on sound land use principles and criteria, are considered to be ecologically sound. They provide for the protection under forest of all the river catchment areas and the steeper slopes. But the radical changes in the ecosystem that are inseparable from development will have a substantial impact on the environment, and the choice of methods used in development will be crucial.

Following large-scale forest clearing there will be a permanent change in the hydrological regime and a phase of accelerated erosion coupled with substantial increases in river sediment loads. There will be a gradual re-adjustment as perennial crops grow, but the new equilibrium level eventually attained will be higher than at present, though it should be acceptable in terms of soil loss and river purity.

From the ecological point of view a number of elements in the Plan will have particular importance, notably the prevention of encroachment of cultivation into areas unsuitable for agriculture, the progressive reduction of shifting cultivation and the eventual afforestation of all land assessed as unsuitable for agriculture.

The extensive harvesting of forests on a somewhat rugged terrain will pose ecological problems on a new scale. It will be particularly important, because of the change in river regimes, to prohibit logging along a defined stream margin, and great care will be needed in the siting and construction of logging roads to prevent the impedance of water flow in natural drainage lines.

The proposed beef ranching scheme will, of course, completely change the local environment, creating new dangers and requiring special precautions. The chief concern will be to preserve a good ground cover and to prevent over-grazing and damaging concentrations of stock.

In all development operations, whether timber extraction, the clearance of land for agriculture, the construction of roads or the exposure of soil for building towns and villages, there will inevitably be serious risks of soil erosion, aggravated by susceptible soils, high rainfall intensities and steep slopes. These risks will be enormously increased by the scale of operations and the tendency of storm water to accumulate in forceful volume not normally encountered.

There are many well-tried techniques for soil conservation, particularly in the preparation of land for planting perennial crops and covering the ground between them; but less attention has been given to the protection of extensive areas of bare land created in road construction and on building sites. And, no doubt, the local circumstances of the Study Area will present certain special

problems. It is therefore strongly recommended that the Government should, as soon as possible, set up a special Soil Conservation Unit to study the erosion dangers inherent in all aspects of large-scale local development and to give advice on practical conservation measures for them. A joint venture between agriculture and forestry, headed by a soil conservation engineer, is suggested. More specifically, it is proposed that this unit should select a number of small paired catchments of minor streams, clearing and planting one to agricultural crops and leaving the other under harvested forest and/or virgin forest, to observe the extent to which the change in use affects the hydrological regime. Such studies elsewhere have given valuable guidance in managing subsequent development.

#### 4.2.2 The National Parks Programme

The National Parks Ordinance was enacted in 1954 and allowed for the establishment of a number of park areas throughout the State. The Bako Park was the first, and remains the only one of the eleven areas so far proposed, to achieve full official status.

Under the Wildlife Protection Ordinance of 1957 full protection has been given to thirty-two species of animals and to several birds. But there is ample evidence that there is a rapid decline in certain formerly abundant species as the result of the increase in human population and a more extensive use of shot-guns. It is clear that the only solution lies in the complete protection of all forms of life within substantial areas covering a wide selection of habitats, and not in the largely ineffectual lengthening of protected lists.

The Consultants agree with proposals previously submitted to Government for the creation of five National Parks in the Study Area. They are listed below and their location is shown in Figure 4.1.

Niah

Similajau

Loagan Bunut

Lambir

Sungai Dalam

However, little progress has been made towards the implementation of these recommendations, and both Loagan Bunut and Sungai Dalam have been subjected to logging operations.

A national park—in the generally accepted sense of a fairly large tract of country, scenically attractive and with its original vegetation and wildlife complexes virtually intact—is only one of a wide range of possible types of conservation area. A flexible system is required which can cater for areas of all sizes and varieties of purpose, such as coast and watershed protection, preservation of rare plant and animal species, geological and archaeological monuments and examples of fine natural scenery.

Within the Study Area there is scope for several of these conservation interests apart from national parks. Suggestions follow, first in relation to parks already proposed.

### **Niah National Park**

It is now twelve years since this fine limestone massif was proposed as a park, and gazetting is still awaited. In the meantime the massif and its surrounding forest are becoming increasingly isolated by agricultural development, and there is doubt as to the effect on the population dynamics of the swiftlets and bats inhabiting the caves. They have been the subject of a special investigation by the Consultants to determine the likely consequences of extensive development in the area.

Despite the scientific importance of Niah cave with its unique fauna, and the fact that it is designated a National Monument, no adequate management has been provided. Indeed the scientific importance and potential tourist attraction is being destroyed at an alarming rate by the guano digging industry. Already approximately 30 per cent of all fossil guano deposits have been extracted, not only destroying valuable archaeological remains but making the cave extremely dangerous both to the workers themselves and to visitors. This digging is forbidden in the regulations.

A further threat is posed by the massive quarrying operation planned by P.W.D. Quarrying is due to start immediately on part of the southern face of the main limestone massif, and the effects of explosive charges in the soft limestone honey-combed with caves could be far reaching and damaging—as well as dangerous.

Although about half the total area of the proposed park has been classified as suitable for agriculture, the Consultants support the original boundaries. This would protect a fine example of non-peaty swamp forest.

### **Similajau National Park**

This park lies along the coast and contains a wide variety of forest types, one of best scenic beaches in Sarawak and abundant wild life. Access from Bintulu would be easy. The Consultants have suggested a modification of the original proposal. The new proposal is designed to preserve a coastal strip roughly a mile wide and containing 37,000 acres. The agricultural implications of this proposal are acceptable, but the impact on the phasing of forest harvesting in the FAO Unit 1 needs further consideration by the Forest Department.

### **Loagan Bunut National Park**

As long ago as 1956 the Forest Department advocated protection of the virgin peat swamp around the lake. This, and the unique qualities of the lake itself in Sarawak, led to a proposal to create a national park of 12,700 acres in 1963. Despite this, much of the forest was logged over in 1971 to 1973, principally, for its ramin content. Nevertheless the area still has national park qualities: apart from the special interests of the peat swamp forest, the lake itself is believed to have an aquatic ecosystem well worth detailed study with a view to its conservation, but at the same time protecting local fishing rights. It is recommended that the boundaries originally proposed be extended to include more of the catchment areas around the lake, and that the proposal to build a sluice in the channel be deferred until the full implications of so doing are understood.

### **Lambir National Park**

The original proposal for protecting the Lambir Hills is endorsed for its conservation intent, but Forest Reserve status for the larger part of it would be more appropriate.

### **Sungai Dalam National Park**

Since the original proposal the construction of Miri airport has encroached upon the park area. However, as an example of Kerangas forest easily accessible to Miri, the preservation of the remainder is recommended, designating it a Forest Park rather than a National Park.

### **Tanjung Lobang**

This scrub-covered headland contributes much to the pleasant setting of Miri town and it has a good variety of wild life. But these assets are being threatened by coastal erosion and residential development; landslips are occurring. It is suggested that a small coastal protection reserve should be established from the last house on Loak Bay to the bathing station on Brighton Road. Much of the land is a Government Reserve under the Land Code.

### **Bukit Dulit**

Only half this mountain comes within the Study Area but its protection is advocated because it is the only occurrence of montane forest in the Area. Bukit Dulit has a fairly long history of biological investigation, indicating the presence of many rare animals, and it appears to have an interesting flora. It is recommended that the whole Dulit range should be made a conservation area, with special reserve status for the high summits.

### **Lobang-Salai Limestone Outcrop**

In view of the demands that development will make on limited supplies of road stone, it is suggested that biological surveys be made of various limestone outcrops and their cave fauna to decide, before it is too late, whether any of them should be protected. The swiftlets in the Lobang-Salai cave are of special interest because they are a different species from those at Niah and produce the most valuable first quality white nests.

Finally, the Consultants strongly support the Sarawak Government's intention to set up a special section of the Forest Department to assume responsibility for the research, survey and management functions of national parks and similar protected areas, and to prepare a sound State policy for biological resource conservation. In view of the probability of large scale development in the Study Area this measure would seem to be urgent. Eventually a separate Department of Government may well be necessary.

## CHAPTER 5

### INDUSTRIES, MINING AND PRIVATE SERVICES

#### 5.1 GENERAL

The manufacturing industries in Sarawak are presently of minor economic importance and provide only limited employment. Apart from petro-chemical industries, which are based on the existence of oil and gas in the Fourth Division of Sarawak, the development of a modern industrial sector is still in its early stages. This is the case in the whole of Sarawak and even more so in the Fourth Division economic development effort has been concentrated on timber extraction and oil production. The future development of the Study Area will need a special effort to promote the manufacturing industries because the requirements for jobs and increase in income cannot be achieved by the planned development of the agricultural and forestry sectors alone.

Small, medium and large-scale industries should be included in the development in accordance with the availability of raw materials, markets and manpower.

The main difference between small and medium-scale industries on the one hand and large-scale industries on the other is their different needs for infrastructure, markets, management and finance. Small and medium-scale industries could often be developed—possibly with some kind of aid, incentive or participation from the Government—by local inputs of capital, management, ideas and initiative. Large-scale industries, on the other hand, certainly in their early stages, will often have to be built up in co-operation with foreign companies who would provide the necessary inputs of technical know-how, managerial experience and risk capital. In the longer run some of the industries started on a small or medium scale may grow into large-scale industries, locally owned and managed.

#### 5.2 PRESENT AND FUTURE IMPORTANCE OF INDUSTRIES

The present importance of the manufacturing industry in the Study Area is illustrated in Table 5.1, which also shows the target growth rates for this sector. The 4,500 employed at present in manufacturing is less than 12 per cent the total of 39,000 labourers who were employed in the Study Area in 1970 (excluding oil production) and their contribution to the GRP was less than 11 per cent.

TABLE 5.1 PRESENT AND ESTIMATED FUTURE EMPLOYMENT AND PRODUCTION VALUE IN THE MANUFACTURING INDUSTRY

	1970	Growth rate 1970/80 (per cent)	1980	Growth rate 1980/90 (per cent)	1990	Growth rate 1970/90 (per cent)
Number of employed	4,500	6.5	8,500	9.5	21,000	8
Percentage of total employment	12%	—	13%	—	21%	—
Production value/per employed \$	3,600	4	5,400	4	8,000	4
Production value \$ mn	16	11	46	14	168	12.5
Percentage of total GRP	11%	—	16%	—	27%	—

The number of future employees in this industry is shown as rising faster than the population (a growth rate of eight per cent compared to a population growth rate of 4.5 per cent over the period 1970 to 1990), which indicates the Plan's aim of accelerating the industrial growth of the Region. This aims to meet official development goals set out in the Second Malaysia Plan and in the Scope of Work for the Study which, the Consultants believe, can only be attained by combining agricultural and forestry development with an increase of employment in the manufacturing industries significantly above the average for the society as a whole. Such industrialisation is a necessity if the employment targets are to be achieved, because Sarawak has no special advantages as a large-scale agricultural producer. Indeed the reverse is the case and agriculture alone cannot support a growing population, even less sustain it at a rising living standard. Without substantial growth of manufacturing industries and services the population growth of the Region would have to be considerably less than is postulated in the Plan, immigration from other Divisions would be reduced and emigration from the State would become necessary. For humanitarian, social and political reasons the latter solution cannot be acceptable to the Government, and therefore it becomes necessary to encourage capital and industry into Sarawak.

The Study Area has no particular advantage for industrial development compared to other parts of Sarawak: industrial development tends to go where an industrial environment already exists and where good transport connections with the outer world are well established. But to accept this premise and allow industries to develop only in the most favourable economic sites conflicts with the national policy of spreading industries to improve living conditions in all parts of the country. It is clear that both the Federal and State Governments are resolved to give all areas of Sarawak a share in development, and that they have a number of instruments for promoting such a policy.

Because the degree of present industrialisation throughout Sarawak is not great new industries can as well be developed in the Study Area as in any other part of the country. An industrial build-up within this area could be based on local primary products such as timber, agricultural products, oil and gas, and by extending existing processing and manufacturing industries such as those developed Sarawak Shell Bhd. sawmills, shipbuilding yards and building enterprises, and a number of small-scale industries, which have already contributed to the development of an industrial environment.

In Volume I, Chapter 2, Section 2.4, reference is made to an official statement that "for Malaysia as a whole, the manufacturing sector—excluding building and construction—should produce 30 per cent of the GRP by 1990". This target implies an annual growth rate in this sector of 10 per cent, compared with the 12.5 per cent in Table 8.1. The higher growth rate needed in the Study Area can be explained by the following:

- the area is relatively poorly developed for industry.
- future development in the Study Area aims at absorbing 75,000 people from other parts of Sarawak.
- Bintulu is planned to become an industrial centre for the hinterland south of the border of the Study Area as well as within it.
- the manufacturing sector, in this context includes the rapidly growing building and construction sector.

## 5.3 FUTURE INDUSTRIES AND THEIR LOCATION

### 5.3.1 General

New industries will tend to be located close to the sources of their raw material; for instance the first stage timber processing industries. Others will be situated near to markets for their products; for instance workshops (car repair) and small shop-type industries serving the population (bakers, clock makers and book printers).

Geographically the new industries will concentrate around the existing urban centres of Miri and Bintulu. These have the only facilities in the Study Area capable of supporting a manufacturing industry more complex than the strictly raw material based industries. Further industrialisation will be most easily promoted in the Miri area. Besides possessing advantages in internal communication, administration and manpower, Miri has access to cheap fuel such as oil and gas products from within the area. Industrial development, in Miri, of both small scale local production and for export markets should be given priority.

Bintulu is the alternative site for an industrialisation programme within the Study Area. The planned development of raw material-based industries (timber and gas) would provide a suitable base for the establishment of new manufacturing units within the next five years. The extension of the general service level would add to the suitability of Bintulu as an industrial growth pole.

Furthermore if the deep-water port becomes a reality within the same period, improved external and internal communications would justify a large industrial expansion based on local and imported raw materials. The primary development has already been initiated by the planned development of the forest areas north of Bintulu, associated with the establishment of the three timber complexes. These will carry out primary and secondary processing of timber from the forest areas identified by the FAO Forest Industry Development Project. In addition to the planned complexes, auxiliary wood manufacturing industries should also be established in Bintulu to utilize output from forest areas outside the FAO-industry units. These other industries should complement to the timber complexes e.g. smaller industries could re-manufacture wood products from the complexes and other timber producers. In these circumstances Bintulu would become the new centre for woodbased industries in Sarawak. The location of industrial estates in Miri and Bintulu are shown in the town plans presented in Chapter 6.

The development of Long Lama would be stimulated by the establishment there of a timber complex based on the FAO-unit.

## 5.4 PROMOTION OF INDUSTRIES

The industrial development of Sarawak in general, and the Study Area in particular, will necessitate a determined and deliberate effort by the Federal and State Governments in co-operation with domestic and foreign entrepreneurs. Important Government support to such a policy would include financing, tax relief and protective customs duties. Other incentives are mentioned below.

All, or most, of these incentives are already available in Malaysia and, therefore, to Sarawak. But the Consultants believe that, in addition, an organisation is needed to give a more vigorous lead in the industrialisation process. Here again the basic organisation already exists in the shape of the Sarawak Economic

Development Corporation (SEDC), and it is recommended that it should be steadily re-inforced to cope with the increasing work load expected in the future. Among the tasks of SEDC should be:

- (a) to liaise with all industrial development authorities and agencies in Kuala Lumpur to ensure that the needs and potential of Sarawak are always understood and appreciated;
- (b) to take the initiative in attracting to Sarawak branches and subsidiaries of companies already established elsewhere in Malaysia and foreign investors, possibly as joint venture arrangements.
- (c) to take the initiative, in co-operation with town development authorities, to establish industrial estates and workshop premises.
- (d) to serve as a central source of information for all categories of potential investors and entrepreneurs.
- (e) to participate directly in financing and to give advice on possible alternative sources of finance.
- (f) to arrange, in co-operation with appropriate authorities and institutions, the training of entrepreneurs and staff at appropriate levels. Courses would cover elementary technical skills, elementary knowledge of trade and commercial principles and procedures, and management (including accountancy, sales techniques and stock budgetting).

In connection with training SEDC should actively seek and select entrepreneurs and provide for them a consultancy service until they have gained a firm foothold in their new enterprise. This could be of importance in encouraging members of those ethnic groups that have so far had less experience in these activities to actively take them up. It is considered appropriate that all these responsibilities should be with one organisation, SEDC, from which certain functions could be delegated to other appropriate institutions.

In the search for external financial assistance and experience, joint-venture enterprises with foreign firms should be undertaken. In addition every encouragement should be given to establishing national and local enterprises, which obtain outside capital on fixed loan conditions instead of direct foreign investments involving profit-sharing. The necessary technical and managerial capability could, where appropriate, be obtained from technical aid organisations in developed countries, or it could be purchased from foreign research and educational institutions on a short-term basis as well as from technical and managerial consulting firms of various kinds. In this way it should be possible to expand more rapidly the proportion of local investors and entrepreneurs and to strengthen their economic and commercial capacity.

The importance of SEDC as co-ordinator of industrial development should be maintained but, within specific trades, other public and private agencies should play a leading part. The Sarawak Timber Industry Development Corporation (STIDC) is for example already prepared to participate in both manufacturing and marketing aspects of the wood based industries. The industrial promotion organisations should initially be Government or semi-government authorities; later private activity should supplement this initiative.

## 5.5 SMALL-SCALE INDUSTRIES

Despite the economies of scale, that generally favour large-scale industry, certain types of small-scale industries have proved highly viable even in the most industrialised countries. Small manufacturing units have an advantage where nontransportability of the product or relatively high transport costs set a narrow limit to the size of the market that can be efficiently supplied from one producer. Where the demands of the buyers are highly specialised or individualised, the size of the market for any particular item tends to be limited and small manufacturing establishments are often able to meet these demands more efficiently than larger establishments.

To promote small-scale industries a programme is needed which will provide industrial extension services in four main fields: economics, technology, management and product improvement.

Economic assistance starts with assessing the prospects of particular industries, selecting a location and estimating capital requirement and potential markets. After an enterprise has started small-scale entrepreneurs will continue to require assistance with credit, advice on raw materials, labour, factory space and marketing. Existing firms will also need such counselling to diversify their production and improve their efficiency. Industrial extension work may take the form of individual counselling by a visit to the enterprise, a service providing information through pamphlets and publications and regular courses of training.

The building of industrial estates has been recommended as part of the development plan because they are an efficient method of encouraging the establishment, expansion and modernisation of small-scale industry. An industrial estate is a planned area offering space, buildings and a variety of services and facilities. By grouping these facilities together some economies of scale and efficiency of specialisation is obtained which is usually only achieved in large-scale industry.

As a first step towards the implementation of a small-scale industry development programme it is recommended that a department within SEDC should be established with the object of developing and promoting small-scale industry in Sarawak. A working group, possibly assisted by the United Nations Industrial Development Organisation (UNIDO), should be set up having the task of formulating a small-scale industry development policy for Sarawak according to the ideas outlined in this chapter. Having formulated the policy and obtained Government approval the working group should commence implementation within a limited area. This implementation should include an industrial estate and small-scale enterprises outside the estate. Four types of studies would be required, namely:

- area surveys;
- market surveys;
- industry feasibility studies; and
- model schemes.

## 5.6 MEDIUM AND LARGE-SCALE INDUSTRIES

The number of medium and large-scale industries that can be established in Sarawak is limited by the absence of a large local market, a limited range of raw materials and a small skilled labour force. A fundamental need of all industries

is that they should be based on local raw material and/or market availability. The large timber complexes planned by the FAO Forest Industry Project have been described in Chapter 4, but it is recommended that the wood based industrial development should go further. Following a series of pre-feasibility studies of wood manufacturing industries, carried out by the Consultants, it is proposed that a chain of industry units should be established which is completely or partly based on existing medium sized logging licence areas (that is areas with annual log outputs of about 30,000 tons Hoppus). These units would include:

- a sawmill;
- a timber impregnation plant;
- a drying kiln;
- moulding plant;
- prefabricated housing plant.

The expected annual return to capital invested would be more than 20 per cent. Other raw material based industries which should be established as part of a regional industrialisation programme include:

- an iron foundry; and
- a glass container factory.

Pre-feasibility studies have also been carried for these.

The iron foundry should use local scrap iron and imported pig iron aiming to produce standard items like cast iron pipes, man-hole covers, cooking utensils and unlimited types of custom orders. The market projections suggest justification for a foundry with an annual capacity of 1,500 tons by 1980. The presence of an iron foundry would offer facilities to the local iron ship builders and bring a certain rationalisation to this industry which would make it more competitive in relation to outside yards. This could justify a revision of the prevailing customs duty system, which is disadvantageous to local manufacturers serving the transport equipment industry.

Detailed descriptions of the proposed industries, mentioned briefly here, are to be found as opportunities for investment in Annexure I.

## 5.7 BUILDING AND CONSTRUCTION

The planned development of the Study Area will automatically increase the demand for building and construction works which will exceed the capacity of the existing building and construction sector in the Study Area; furthermore increasing demand for building materials will probably raise costs.

By 1985 more than 20,000 dwellings would be needed in the Study Area. The type of houses required and the available construction capacity in the Area indicate that new ways must be sought to satisfy the demand. This could to a great extent be met by the establishment of a wood-based, prefabricated housing industry which would not only increase output for local use, but create an opportunity for export.

## 5.8 MINING

### 5.8.1 Oil and Gas

The oil and gas deposits and their utilisation have been mentioned in Chapter 1. The off-shore works and the refinery in Lutong are currently estimated to employ 125 expatriates and 875 local staff. The activities and the staff have recently been increased and further expansion is expected in the near future. Apart from generating a return on invested (foreign) capital and providing salaries for expatriate staff, this industry generates direct income for local staff and derived incomes for those supplying it and its expatriate staff with goods and services. These effects will, of course, increase in proportion to the growth of the industry itself.

The LNG-plant which is expected to be constructed at Tanjung Kidurong near Bintulu, will employ up to 4,000 persons during construction of which a substantial number could come from outside the Region and the State. It is recommended that as many locals as possible should take part in the construction stage to give them training and experience in industrial work. When finished, the plant is expected to employ only about 350 persons. The economic impetus from the construction period, which is expected to last four years, and from the construction of the port, should be deliberately used to start the new Bintulu Regional Centre.

Liquid gas will be pumped into specially constructed ships at a private jetty and transported to Japan. The industry will have some spin-off effects for the Study Area. The staff and workers living in Bintulu will need numerous supplies and services and the plant itself will require supporting services; furthermore the gas will be available for local industrial energy. In Miri there is already a relatively cheap supply of natural gas which is available for use in industry.

### 5.8.2 Limestone and Quarries

The occurrence of limestone in the Study Area could be exploited economically for different purposes; cement manufacturing, soil amelioration for agricultural purposes and roadstone are the most important.

There are large outcrops of limestone in the Batu Gading area in the Baram District and close to Batu Niah; the latter are particularly suitable for cement manufacture. This limestone together with argillaceous material available in the Kuala Baram area and cheap gas could form the technical base for a klinker plant. Government has, however, recently agreed plans for a large cement plant near Kuching and present market prospects do not justify a second cement industry in Sarawak and Sabah in the foreseeable future.

Agricultural lime is a necessary input for cocoa and probably also for pasture. Allowing for a limited use of lime for other crops an annual supply of about 3,000 tons would be required for plantings up to 1980. This is probably insufficient to justify a crushing plant but the situation should be reviewed as the demand for agricultural lime increases.

Limestone is the only available source of roadstone in the Fourth Division and although it is not ideal, it is acceptable. The quantities that will be needed have not been determined, but the present six quarries (two in Niah, two in Baram, one at mile 22 from Bintulu and an old working near Sibuti) might not have sufficient capacity to meet future demand. Investigations into the possibilities

of expanding existing quarries or opening up new ones, are in progress, but it is unlikely that the establishment of a large-scale operation (200,000 cubic yards per year) will not be feasible with the present market structure.

### 5.8.3 Antimony

The possibilities of exploiting stibnite in the Tinjar area have been considered by the Consultants in the light of available information, both Government and private. Access to the areas is difficult and, with the present transport network, no economically feasible exploitation can be considered. An unexpected rise in prices for antimony could change this situation.

## 5.9 PRIVATE SERVICES

Private services comprise a wide range of activities which serve private households, the private production sector and the public sector. Individual establishments can range from a highly capitalised bank business to a one-person stall. The sector can be classified as follows:

- **Retail Trade;** including trade in:
  - **consumer goods** sold from shophouses or stalls for immediate consumption, including such items as food, fruit, clothing, books and jewellery, and for durables such as refrigerators and furniture;
  - **capital goods** sold from shophouses, stores and workshops for production, such as tools, machinery, transport and equipment, outboard motors and hardware.
- **Wholesale Trade;** being the sale of consumer and capital goods to retail dealers or to large consumers such as schools, military barracks and factories.
- **Specialised Services;** consisting of professions such as medical practitioners, lawyers, auditors, engineers and architects.
- **Higher Business Services;** such as banks, insurance companies and brokers, some of these services being performed through a network of branch organisations.
- **Other Services;** including hotels, restaurants and coffee-houses, cinemas, photographers and travel agencies.

By far the greater number of these activities are located in larger towns with only a few, such as retail shops, being established in villages. The number and type of private service establishments varies according to the size and income of the population in the hinterland of the towns and villages concerned. Thus these services will increase in the future at a rate equal to general development. In Supporting Report 6 the expected norms and standards at which new private services will be established in the new and expanding towns of the Study Area are given.

## 5.10 PRESENT AND FUTURE IMPORTANCE OF SERVICES

An adequate statistical base does not exist for estimating specific target figures for the private service sector alone, but only for the service sectors as a whole. For the whole group the following table expresses the target development.

TABLE 5.2 PRESENT AND FUTURE TARGET IN EMPLOYMENT AND PRODUCTION VALUES IN SERVICES

	Growth rate		Growth rate		Growth rate	
	1970	1970/80 (per cent)	1980	1980/90 (per cent)	1990	1970/90 (per cent)
Number of employed	9,500	3	13,000	6	23,000	4.5
Percentage of total employment	24%	—	21%	—	23%	—
Production value per employed \$	5,300	2.5	6,800	2.5	8,700	2.5
Production value \$ mn	50	6	90	8.5	200	7
Percentage of total GRP	34%	—	30%	—	32%	—

For the whole period 1970 to 1990 employment is envisaged as growing at the same rate as the population, a little less in the first decade, a little more in the second. The reason for this moderate growth is that these sectors appear at present to contain some over staffing or under-employment—which could be gainfully used in the first period, while in the second period the continued increased activity in agriculture and industries will have to be met by an increase in staff.

The target increase in production value is also rather modest, reflecting an expectation that some of the people occupied in these services belong to the higher paid groups who, in the intended process of redistribution of income, will face a relative reduction of their personal incomes.

## 5.11 PRESENT AND FUTURE STRUCTURE OF TRADE AND COMMERCE

### 5.11.1 General

The present trade pattern of the Study Area reflects the basic features of the production pattern, which are:

- subsistence production of food and other domestic necessities;
- production of moderately processed products for export, such as logs, ribbed smoked sheets of rubber, ungraded pepper and oil;
- a modest production of industrial consumer and capital goods.

For these reasons a significant part of the trade is heavily oriented towards external markets, based largely on the collection and export of a limited number of primary products, as well as the import and local distribution of foodstuffs, consumer goods and capital goods. The Fourth Division, in common with the rest of Sarawak, trades more with the outside world than it does with neighbouring Divisions in the State.

Commerce is therefore heavily dependent on export/import trade and is consequently particularly sensitive to fluctuations in the price of commodities on world markets. In addition most external trade, excluding timber and the re-export of petroleum, is channelled through commercial centres outside the Study Area, mainly Sibul, Kuching, Singapore and Peninsular Malaysia. There is little direct consignment of goods and transshipment and intermediate trade connections result

in higher costs. The trading position of Miri, in particular, is poor. Unlike the other important towns in Sarawak, Miri is not a local supply point for a major river-based trade network and, despite expanded road links, continues to serve only a restricted hinterland relative to its size.

Four major factors are likely to alter the trade pattern of the Study Area in the future:

- (a) an expansion of internal trade resulting from the growth of local manufacturing industries and increased agricultural production for domestic consumption in urban and estate areas;
- (b) increased Government involvement in agricultural marketing, credit and supply;
- (c) improved port facilities, possibly including a deep water port or other goods handling facilities at Tanjung Kidurong, reducing the present dependence on external ports and commercial centres;
- (d) extension of the road network linking Miri with other major towns and with an enlarged road-supplied regional market.

### 5.11.2 Trade Networks

Existing trade relations are formed by ties that extend from major importation firms through retail and smaller wholesale dealers to a network of rural bazaars, isolated shops and itinerant hawkers. Credit and consumer goods are channelled downwards through systems, while primary products are channelled upwards for eventual export. Horizontal relationships between firms engaged in trade at the same level are characterised by competition between generally small, family-owned businesses which provide more or less identical services. This system is suited to present circumstances but, as mentioned above, it is likely to change under the process of modernisation recommended in the Plan. Restructuring this network is, however, likely to prove difficult in areas already settled because individual relations are not exclusively economic in nature. Nevertheless it is both desirable and expected that rationalisation of the network should be undertaken through a reduction of multiple links in the trade chain, and through the emergence of larger, more differentiated firms and specialised shops. To some extent the change, especially the emergence of specialised shops, is already manifest in Miri and to a lesser extent in Bintulu and Marudi.

Current employment in trade is somewhat less than 2,000 persons, or under five per cent of the total number employed in the Study Area. Over a third of this number consists of working proprietors which is indicative of the small size of existing establishments. It is expected that, in the future, the total number of persons engaged in trade will increase more slowly than the volume of trading activity; individual firms will handle a greater turnover but the proportion of employees to proprietors will increase only slowly as the firms grow larger.

### 5.11.3 Retail Trade

At present the operation of most retail firms combines retailing with credit supply, storage, grading, transport and marketing including knowledge of commercial contracts and market conditions. As a result, the shopkeeper plays an indispensable role in the commercial life of the country. Most existing retail enterprises are family concerns. The great majority are Chinese owned, although

in recent years a growing number of Malay, Iban and other native people have opened shops, some as privately owned ventures others as co-operatives. Most operate with little capital and are typical village shops.

#### 5.11.4 Wholesale Trade

Wholesale trade is dominated by major importation firms that deal largely in branded consumer goods for which they act, often through a network of branch offices located in the larger urban centres, as exclusive local distributors. These firms are often owned by expatriates or are based outside Sarawak and conduct business either through local agents or secondary wholesalers, a number of whom operate launches or lorries and thus absorb a transport function in their operations. Where they monopolise transport this combination can severely limit competition. A large part of the current export commodity trade in the Study Area is handled by boat-owners who buy directly from bazaar traders or act as transport agents.

A desirable rationalisation in the future would be the formation of larger firms more directly linked to their retail outlets and the emergence of a greater number of local wholesalers or branches of externally based firms operating in the Study Area.

## CHAPTER 6

### SETTLEMENT PATTERN

#### 6.1 INTRODUCTION

The settlement pattern for the Study Area is geographically connected to the recommended physical structure outlined in Volume I, Chapter 2, Section 2.3 where the location and physical aspects of development are discussed and described. The present chapter describes how the areas selected for development can be settled by applying a principle of urbanisation of rural areas, and how the total settlement structure is expected to function.

The planned settlement patterns for the Study Area by 1980 and 1990 are illustrated in the Action Programme and Regional Plan Maps at the rear of this Report. The settlement planning process has passed through several stages, starting with a study of the Johore and Pahang Tenggara Reports which, in the Terms of Reference, were referred to as possible models for the present Study. In particular the Pahang Tenggara type of settlement was indicated as favoured by the Federal Government. The Consultants therefore compared the large settlement system recommended by the Pahang Plan with the small village system currently being implemented by the SLDB on its oil palm schemes in the Study Area. The conclusion was that on the whole a Pahang-type system would be the most appropriate for the conditions in the oil palm schemes. SLDB would concentrate into one town, all the workers on the oil palm estates in its three southern Lambir-Subis schemes. The town would be in addition to an already existing village but would replace three planned villages. For reasons, explained later, SLDB could not accept such a pattern in the Lambir-Subis RDA.

In the planning of future large-scale development, however, the basic principle of creating a limited number of relatively larger towns in the rural areas has been adopted, but the Pahang system has been modified to incorporate associated satellite villages. The settlement pattern which has, for convenience, been called Urbanisation of Rural Areas, is described below. It is the result of meeting the need for diversified cropping and a major objective of the Second Malaysia Plan which, as explained in Volume I, Chapter 2, is the modernisation of rural life. Basically this means establishing certain urban amenities in the rural areas. The amenities required most by the people have been listed in Chapter 3 as:

- security of persons and property;
- easy access to health and schooling services;
- facilities for worship and religious ceremonies;
- opportunities for diversification of employment;
- facilities for recreation.

To satisfy these requirements necessitates quite extensive and rapid urbanisation in the new development areas which are at present without any significant towns. As the existing settlements have populations of only 500 to 1,000 people it will be necessary to create viable new towns, or service centres, of a higher order. Within the foreseeable future this process can only be achieved by using

the people employed in agriculture and forestry to create the towns and villages. This establishes a connection between the type of agricultural development and the appropriate type of settlements. This is discussed below.

## 6.2 URBANISATION OF RURAL AREAS

### 6.2.1 Agriculture and Urbanisation

'Urbanisation' is here used in its widest sense; it includes not only the introduction of physical elements such as public and private service facilities, but also non-physical elements like the way of organising the daily routine of each person and household, the introduction and expansion of a cash economy, the acceptance by people of a different attitude towards change and innovation and providing for increased education.

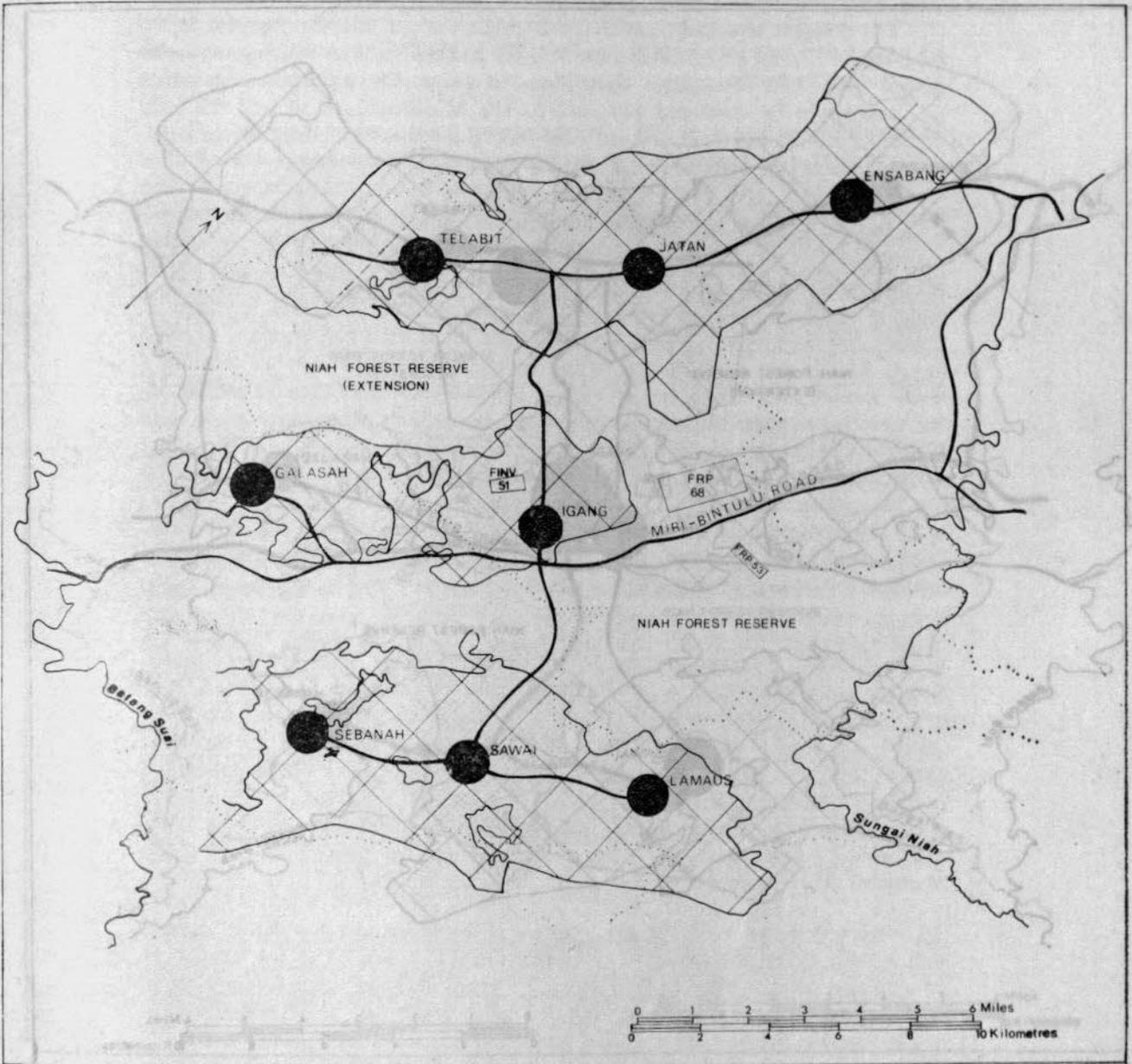
Urbanisation of the new development areas could be arranged in different ways, and the Niah-Suai RDA was used as an example for detailed studies. Three possible settlement patterns each with different relationships between agriculture and the network of settlements and service centres were studied.

Any planned settlement pattern for the area between Miri and Bintulu must be designed primarily to support and serve the development of agriculture and forestry. The agricultural plan, as explained in Chapter 3, requires the establishment of large nucleus estates with, around them, mutually supporting smallholder villages, road based improvement and private farmers.

The extent of the agricultural land attached to one village would be based on a maximum walking distance of 1.5 to 2 miles from the village. Thus the cultivated area associated with a village would be limited to a maximum of 5,000 to 6,000 acres and the village would, at the most, consist of 1,500 to 2,000 people. This corresponds to the acreages and size of villages presently implemented by SLDB on its oil palm schemes.

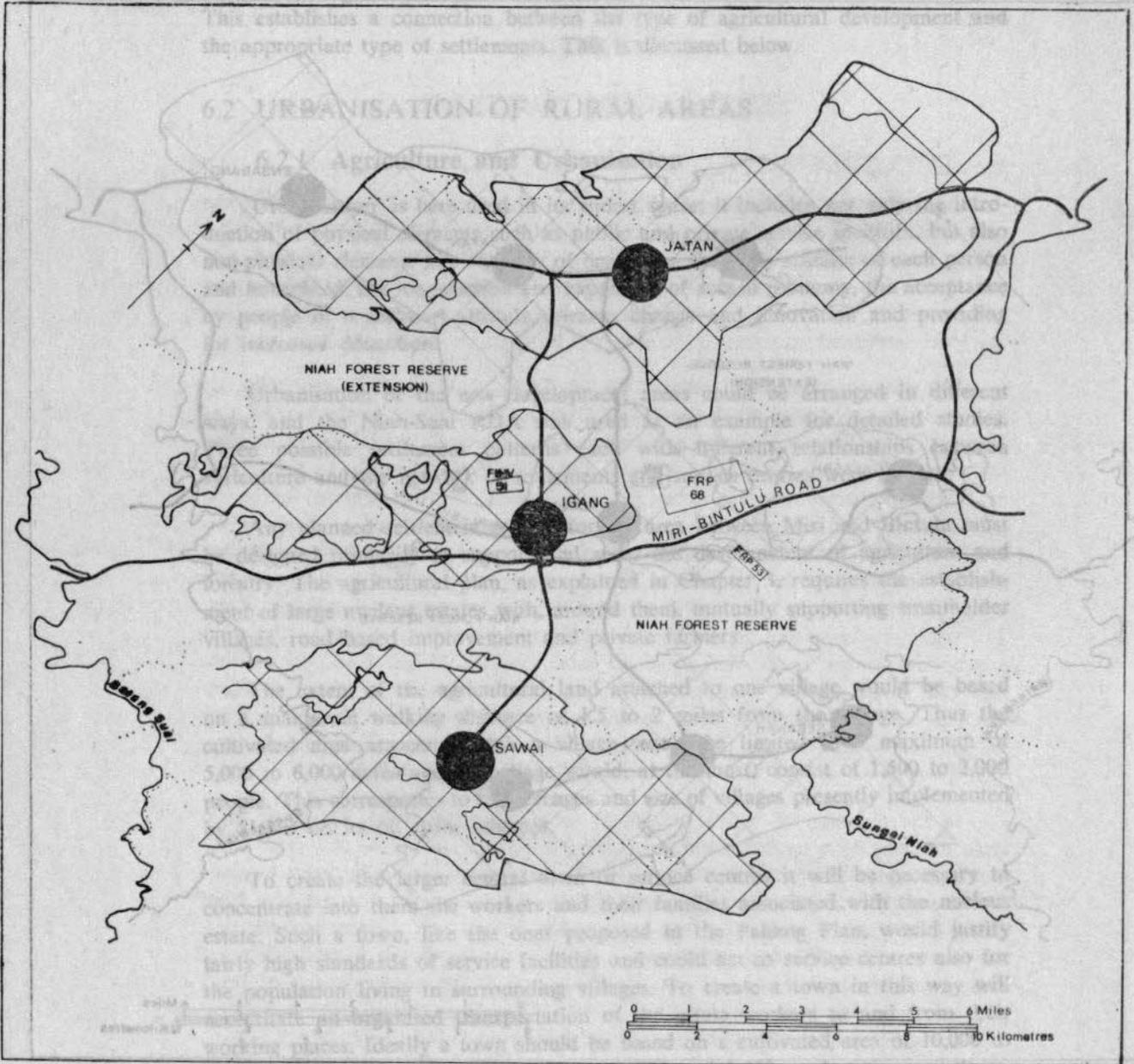
To create the larger central town or service centres it will be necessary to concentrate into them the workers and their families associated with the nucleus estate. Such a town, like the ones proposed in the Pahang Plan, would justify fairly high standards of service facilities and could act as service centres also for the population living in surrounding villages. To create a town in this way will necessitate an organised transportation of the estate workers to and from their working places. Ideally a town should be based on a cultivated area of 10,000 to 20,000 acres which would require between 625 and 1,250 workers in agriculture, equivalent to a population of 3,500 to 7,000 people who would be the creating force for the town. An alternative settlement pattern would be to create on the estate three or more settlements of the same size as the proposed villages for smallholders. This would be a system similar to the present SLDB settlement pattern in the Lambir-Subis RDA.

A combination of permanent estates containing larger towns surrounded by smallholder villages, offers the opportunity of obtaining a differentiated settlement pattern with a hierarchy of service towns which would constitute a desirable urbanisation of the rural areas. In this system the location and combination of areas for permanent estates and for smallholders will be of great importance.



**Model I**

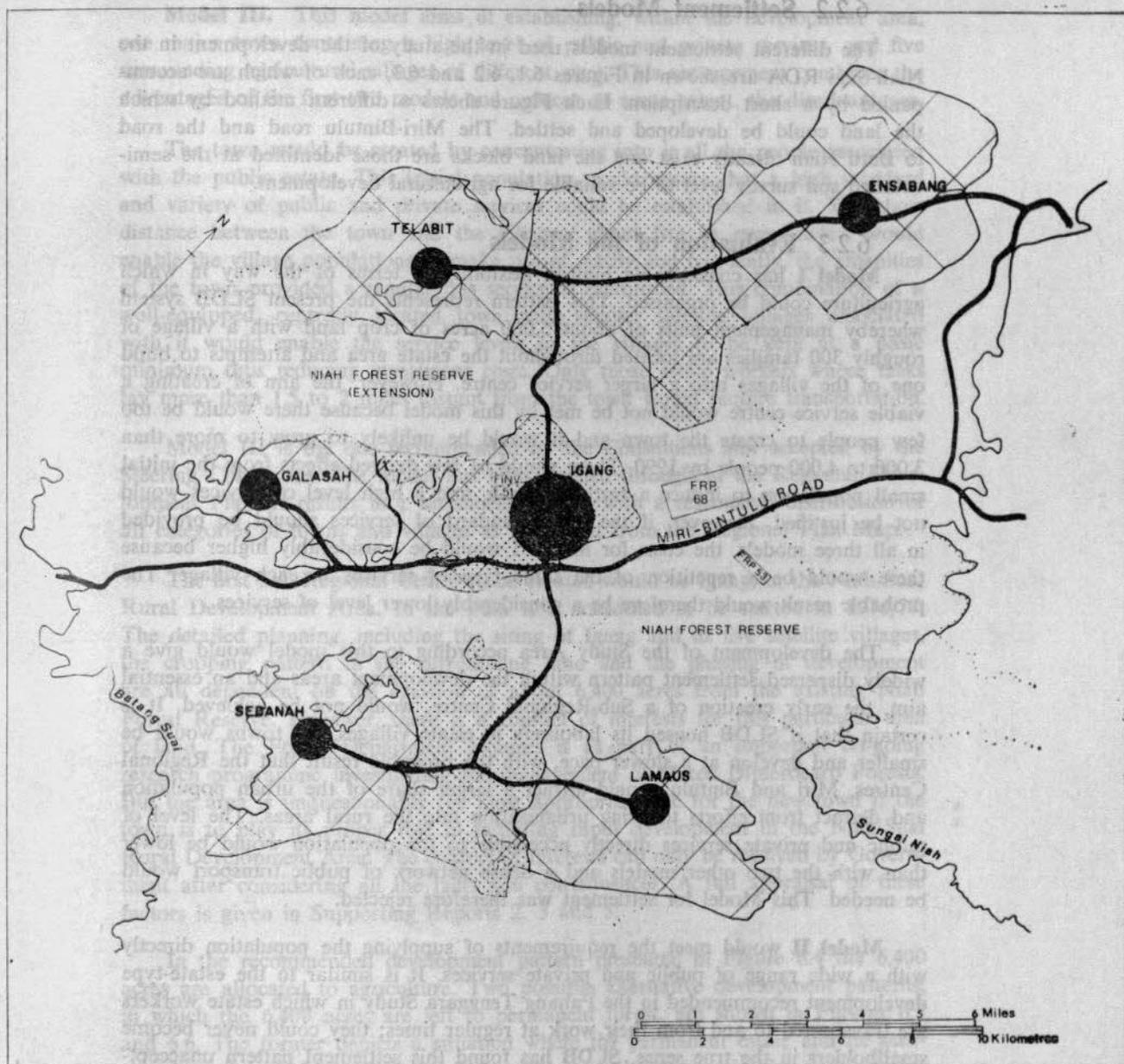
This settlement pattern represents the present SLDB system of several small villages. It is based on eight settlements, each with an adjoining cultivated area ranging from 2,500 to 6,500 acres. The maximum walking distance from any centre to any part of land associated with it is 1.5 to 2 miles, which corresponds to about 30 minutes of walking. The settlement model could be applied to estates, to smallholders or a combination of the two. The main town would have about 3,000 people and each of the villages 1,000 to 2,000 people. The connection between the centres would be the main road system in the area.



**Model II**

This settlement pattern consisting of three large towns each with a population ranging from 3,000 to 7,000, is suitable for estates and for a limited number of smallholders. Each town would have an adjoining 7,000 to 15,000 acres of cultivated land, of which 4,000 to 5,000 acres nearest each town could be managed by smallholders. The remaining 21,000 acres could be run on an estate basis requiring organised transport of the workers. The pattern is similar to the one proposed in the Pahang Plan.

Figure 6.3



**Model III**

This model is suitable for a combination of estates and smallholders and at the same time could provide a high degree of urbanisation. The shaded area associated with the central town (14,000 acres) could be kept permanently as an estate. Organised transport for the field workers would be required in this area. The 2,500 to 5,000 acres around each of the five villages could be worked by smallholders. The main town would have a population of 8,000 to 10,000 and each village would have about 1,000 to 2,000 people depending on the size of the surrounding planted area.

## 6.2.2 Settlement Models

The different settlement models used in the study of the development in the Niah-Suai RDA are shown in Figures 6.1, 6.2 and 6.3, each of which are accompanied by a short description. Each Figure shows a different method by which the land could be developed and settled. The Miri-Bintulu road and the road to Batu Niah already exist and the land blocks are those identified at the semi-detailed soil survey level to be suitable for agricultural development.

## 6.2.3 Evaluation of the Models

**Model I** has considerable built-in flexibility in terms of the way in which agriculture could be organised. This pattern represents the present SLDB system whereby management units of about 5,000 acres of crop land with a village of roughly 300 families are located throughout the estate area and attempts to build one of the villages into a larger service centre. However, the aim of creating a viable service centre would not be met by this model because there would be too few people to create the town and it would be unlikely to grow to more than 3,000 to 4,000 people by 1990. There would be few derived effects from the initial small population to induce a further growth, and a high level of services would not be justified. However, if the same standard of services should be provided in all three models, the costs for Model I would be considerably higher because there would be a repetition of the same type of services in each village. The probable result would therefore be a considerably lower level of services.

The development of the Study Area according to this model would give a widely dispersed settlement pattern within the development areas and an essential aim, the early creation of a Sub-Regional Centre, would not be achieved. It is certain that if SLDB housed its labourers in estate villages, the towns would be smaller and develop at a slower pace, with the probable result that the Regional Centres, Miri and Bintulu, would attract a larger share of the urban population and detract from efforts to bring urbanisation into the rural areas. The level of public and private services directly accessible to the population would be lower than with the two other models and a dense network of public transport would be needed. This Model for settlement was therefore rejected.

**Model II** would meet the requirements of supplying the population directly with a wide range of public and private services. It is similar to the estate-type development recommended in the Pahang Tenggara Study in which estate workers are transported to and from their work at regular times; they could never become smallholders in the true sense. SLDB has found this settlement pattern unacceptable because of the exceptional organisational problems likely to arise in association with having estate workers and smallholder farmers intimately mixed in the same town. Also by having all the estate lands located beyond the smallholder lands surrounding the towns would mean transporting all estate workers to and from their places of work. For these reasons Model II was excluded from further consideration.

However, the per capita costs of providing services would be relatively low. Development of the Study Area to this Model would result in no new villages, but the concentrated settlement pattern would be compatible with the aim of creating viable service centres and it would be well suited for a relatively cheap public transport system.

**Model III.** This model aims at establishing, within the development area, one major town containing a high level of public and private services, and five surrounding agricultural villages of different sizes. This arrangement combines the advantages of the first two models and reduces, to some extent, the disadvantages.

The town would be created by concentrating into it all the people associated with the public estate. This initial population would ensure that a high standard and variety of public and private services could be established in it. The short distance between the town and the villages, about five to seven miles, would enable the village populations to make use of, easily and frequently, the amenities of the town provided a regular bus service is established. This combination of a well-equipped, centrally located town with smaller satellite villages associated with it would enable the service levels in the villages to be kept at a basic minimum thus reducing investment costs. Only those estate workers whose tasks lay more than 1.5 to 2 miles distant from the town would require transportation.

Model III is the one recommended by the Consultants and accepted by the Steering Committee. The model has been applied throughout the Regional Development Plan. It results in a settlement pattern with a reasonable distribution of all categories of towns and villages as is evident from the Regional Plan Map.

The first Sub-Regional Centre to be created would be Igang, in the Niah-Suai Rural Development Area. In the Plan it is scheduled to be started in 1976/77. The detailed planning, including the siting of Igang and its five satellite villages, the cropping pattern in the surrounding land and the phasing of development are all dependent on the excision of about 6,400 acres from the existing Niah Forest Reserve. However, there is a conflict of interests for this particular area of land. The Forest Department requires it as part of an important on-going research programme investigating the management of Mixed Dipterocarp Forests. But the area is unquestionably the most appropriate site for the new town if the town is to play its proper role in initiating rapid development in the Niah-Suai Rural Development Area. The conflict of interests can only be resolved by Government after considering all the facts and consequences. A full appraisal of these factors is given in Supporting Reports 2, 3 and 5.

In the recommended development pattern presented in Figure 6.4 the 6,400 acres are allocated to agriculture. Two possible alternative development patterns, in which the 6,400 acres are left to permanent forest, are shown in Figures 6.5 and 6.6. The former depicts a situation where the permanent estate and its associated towns would have been given a peripheral location in the development area. Under these conditions the town would not be surrounded by the villages and compared with the first situation, the inter-action between the town and the villages would be less effective; the town would develop more slowly and to a lower level in the urban hierarchy.

The second alternative—Figure 6.6—might lead to an acceptably large town, but, again compared with the first situation, it would develop more slowly because the villages in the Kabatu land block cannot be established until about 1985, and because the town's location would lack the impetus given by a position close to the main traffic line of the area, the Miri-Bintulu Road. In the event of Government deciding to leave the 6,400 acres under permanent forest then a development pattern following the second alternative would be the more preferable.

### 6.3 SETTLEMENT PATTERN FOR THE STUDY AREA

The settlement Plan for the Study Area is, as mentioned, based on the concept of 'urbanisation of rural areas' and on a strategy of concentrating development to a limited number of 'growth poles' as described in Volume I, Chapter 2.

The urban population in Sarawak represents only 25 per cent of the whole population; in Fourth Division it is 27 per cent, but in the Study Area 35 per cent. Following implementation of the Regional Plan, it is estimated that 41 per cent of the population in the Study Area would live in towns by 1980 and 52 per cent by 1990. For the whole period 1970 to 1990 this would correspond to an annual growth rate of the urban population of 6.4 per cent.

At the moment Sarawak has three major towns (or Regional Centres): Kuching (pop. 110,000), Sibü (pop. 50,000) and Miri (pop. 27,000). Current Government plans are that Bintulu should develop into a Regional Centre serving not only the Fourth Division but also areas south of the Kemena river. These Regional Centres will be the major 'growth poles' in the economy of Sarawak; they will contain the higher administration and education facilities at the Divisional level, business headquarters and the major part of trade and industry. By their location they will contribute to a more even distribution of economic activities over the State. The Study Area will be well served in having two Regional Centres, Miri and Bintulu.

The Plan envisages four new towns in the new agricultural areas on both sides of the Miri-Bintulu Road. These four new towns together with Miri and Bintulu would form the main urban core in the Study Area.

In addition provision is made, by the construction of the Long Lama and Labang-Tubau roads, to extend development and urbanisation into the interior of the Study Area.

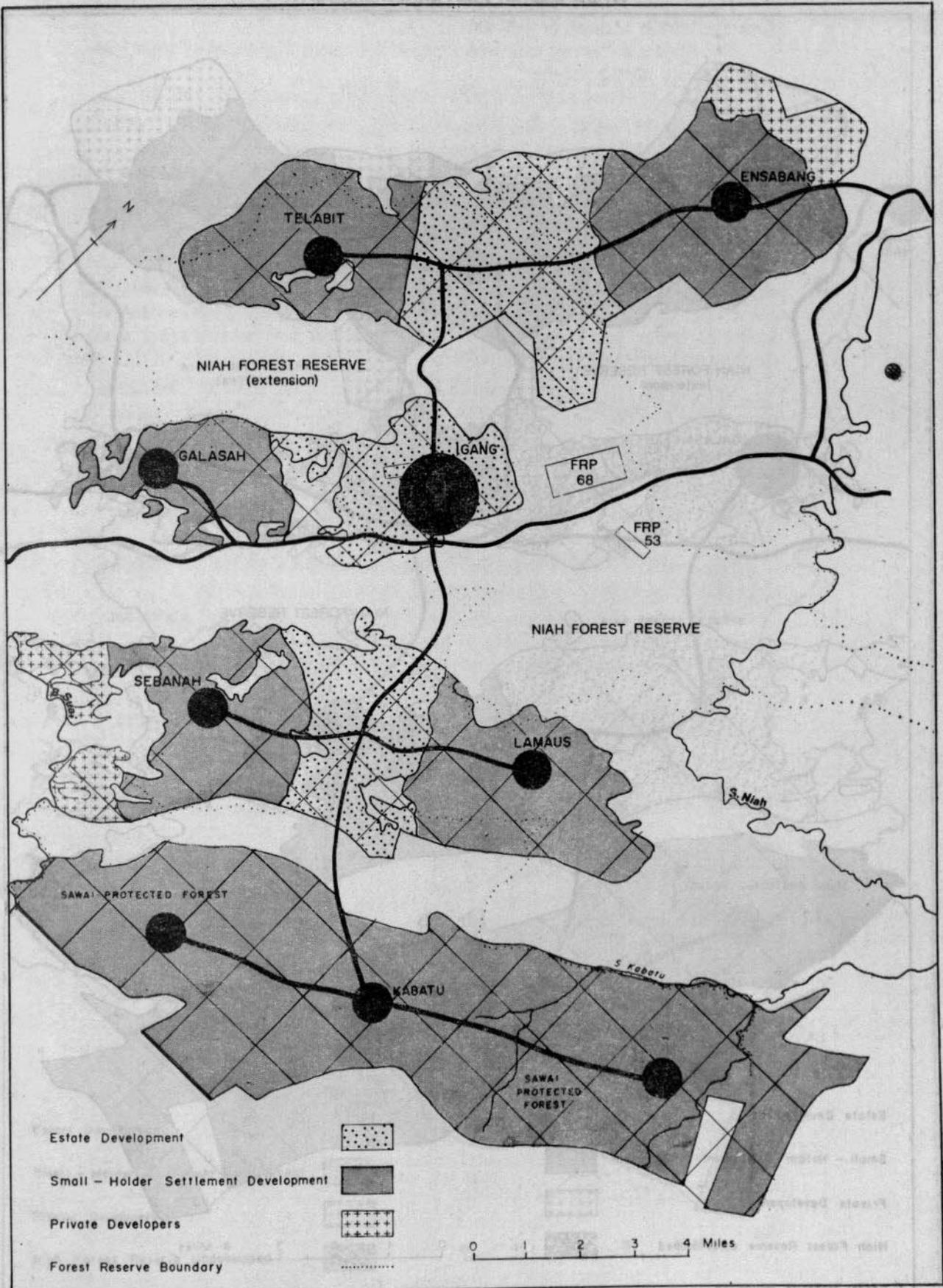
The areas around Long Lama, Labang and Tubau have dispersed settlements mainly of Ibans and other indigenous people, who live along the rivers and practice shifting cultivation of hill rice. In order to provide the people with urban facilities recommendations have been made to establish nucleus developments (agricultural and/or forestry) in each of the areas on which to base further development.

Long Lama town is expected to grow to the status of a Sub-Regional Centre by 1990. Its growth would be due mainly to the road increasing its importance as a trading centre for the Baram area, and its future position as a wood processing centre based on the vast forest resources east of the town. Also, to some extent, on improved agriculture close to the new road.

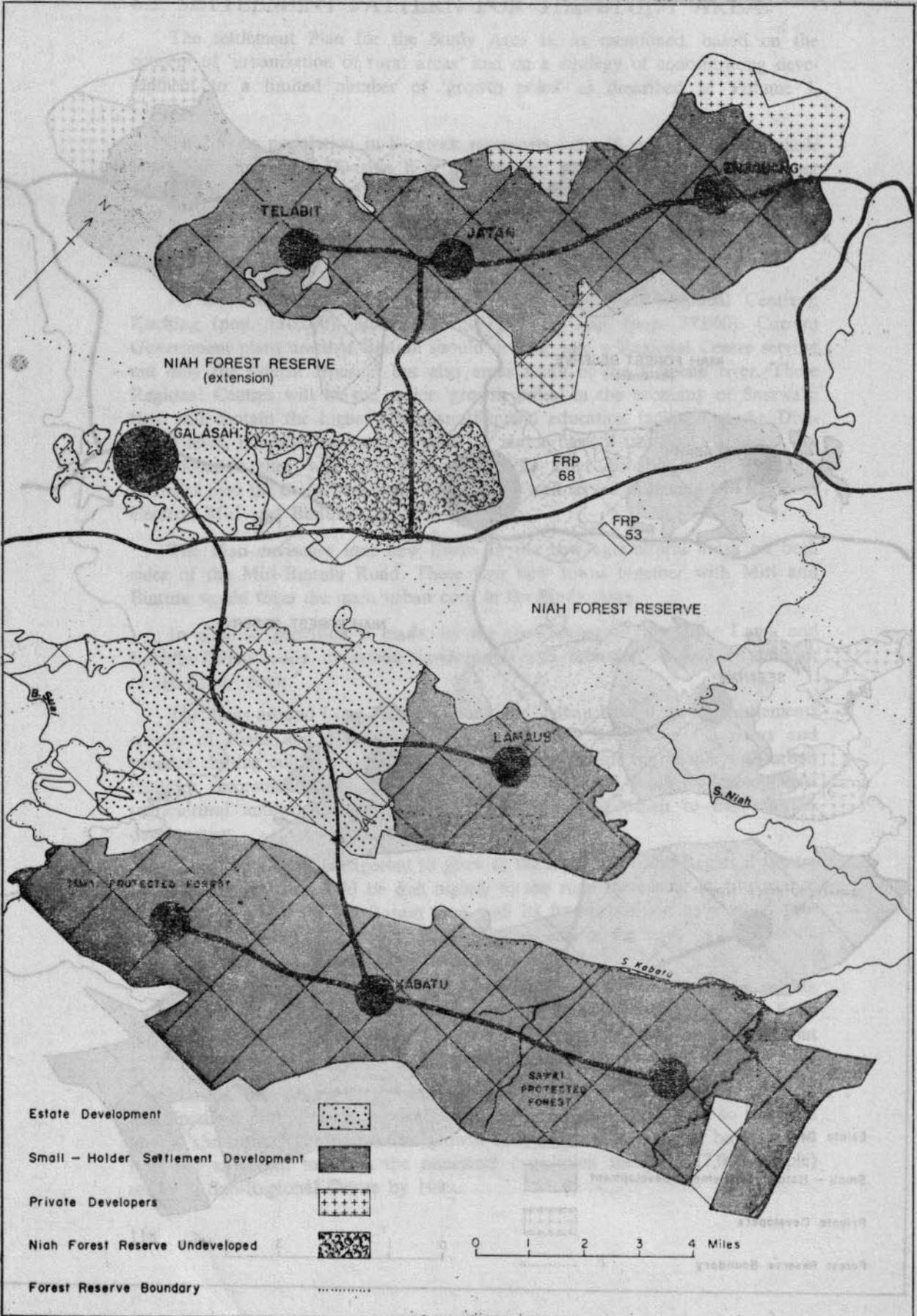
In the Labang-Tubau area the nucleus planned is the large-scale private agricultural development of the Beseduan land block, which would form the basis for a Service Centre in Beseduan. This town could reach a population of about 5,000 by 1990 and would have an important function in the area.

Marudi, with an extensive bazaar area and a wide range of public services, has already a position as a Sub-Regional Centre, which it is expected to maintain also in the future. The population growth of Marudi, however, will be slow and it is not envisaged to reach the minimum population threshold (7,000 people) set for a Sub-Regional Centre by 1990.

# MODEL 3 RECOMMENDED SETTLEMENT PATTERN



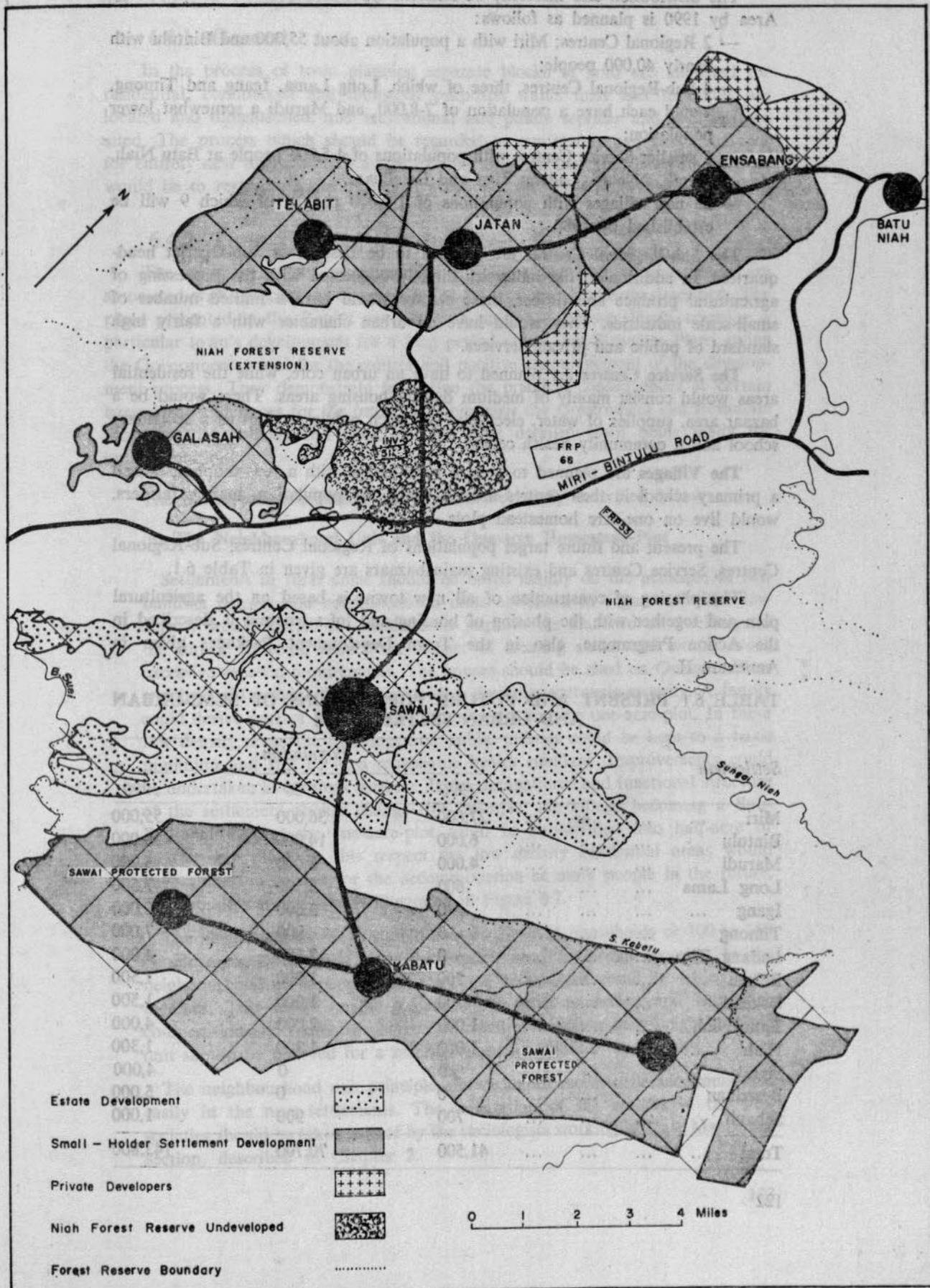
MODEL 3 ALTERNATIVE 1



- Estate Development 
- Small - Holder Settlement Development 
- Private Developers 
- Niah Forest Reserve Undeveloped 
- Forest Reserve Boundary 

0 1 2 3 4 Miles

MODEL 3 ALTERNATIVE 2



The distribution and hierarchy of different types of settlements in the Study Area by 1990 is planned as follows:

- 2 Regional Centres; Miri with a population about 55,000 and Bintulu with nearly 40,000 people;
- 4 Sub-Regional Centres, three of which, Long Lama, Igang and Timong, would each have a population of 7-8,000, and Marudi a somewhat lower population;
- 5 smaller Service Centres with populations of 4-5,000 people at Batu Niah, Sigrak, Nyalau, Ladang Tiga and Beseduan;
- 26 new villages with populations of 1-2,000 people, of which 9 will be established by 1980.

The Sub-Regional Centres are planned to be District or Sub-District headquarters. In addition to the industries directly connected with the processing of agricultural produce and timber, these centres would have a limited number of small-scale industries. They would have an urban character with a fairly high standard of public and private services.

The Service Centres are planned to have an urban core, while the residential areas would consist mainly of medium density housing areas. There would be a bazaar area, supplies of water, electricity and such public services as a secondary school and a community health centre.

The Villages are planned to have a rural image with a few shophouses and a primary school in their centres around which the population, mainly farmers, would live on one-acre homestead plots.

The present and future target populations of Regional Centres, Sub-Regional Centres, Service Centres and existing main bazaars are given in Table 6.1.

The phasing of construction of all new towns is based on the agricultural plan and together with the phasing of housing and infrastructure is described in the Action Programme, also in the Town Development Packages given in Annexure II.

TABLE 6.1 PRESENT AND FUTURE POPULATIONS OF SEMI-URBAN AND URBAN SETTLEMENTS

Settlement	Population		
	1970	1980	1990
Miri ... ..	27,000	36,000	55,000
Bintulu ... ..	6,000	14,000	38,000
Marudi ... ..	4,000	5,000	5,000
Long Lama ... ..	600	2,500	7,500
Igang ... ..	0	3,600	8,000
Timong ... ..	0	900	7,000
Ladang Tiga ... ..	0	2,500	4,000
Beluru ... ..	500	1,000	1,500
Bekenu ... ..	700	1,000	1,500
Batu Niah ... ..	1,000	2,000	4,000
Niah ... ..	1,000	1,300	1,300
Sigrak ... ..	0	0	4,000
Beseduan ... ..	0	0	5,000
Sebauh ... ..	700	900	1,000
<b>Total ... ..</b>	<b>41,500</b>	<b>70,700</b>	<b>143,800</b>

## 6.4 TOWN PLANNING

### 6.4.1 General

In the process of town planning separate blocks of land are allocated for residential, commercial and industrial purposes, traffic lines and terminals are located and dimensioned, and recreational and public services and facilities are sited. The process which should be regarded as continuous can be carried out for entirely new towns as well as for existing ones. In the latter case the purpose would be to restructure the town and prepare it for further growth.

### 6.4.2 Town Planning Principles

The main principles recommended for town planning in the Study are associated with the concept of urbanisation of rural areas, already described. The plans presented in the Report are not once-and-for-all Master Plans, covering a particular town's development for a long period ahead, but Structure Plans giving the Government a tool for the control and positive encouragement of the development process. They demonstrate in outline the practical consequences of certain basic ideas and hopes for the future. On this basis the Government can formulate more specific policies and work out the final detailed town plans ready for implementation.

The basic recommendations and criteria are briefly described below:

#### (a) **The Neighbourhood Unit and the One-acre Homestead-Plot**

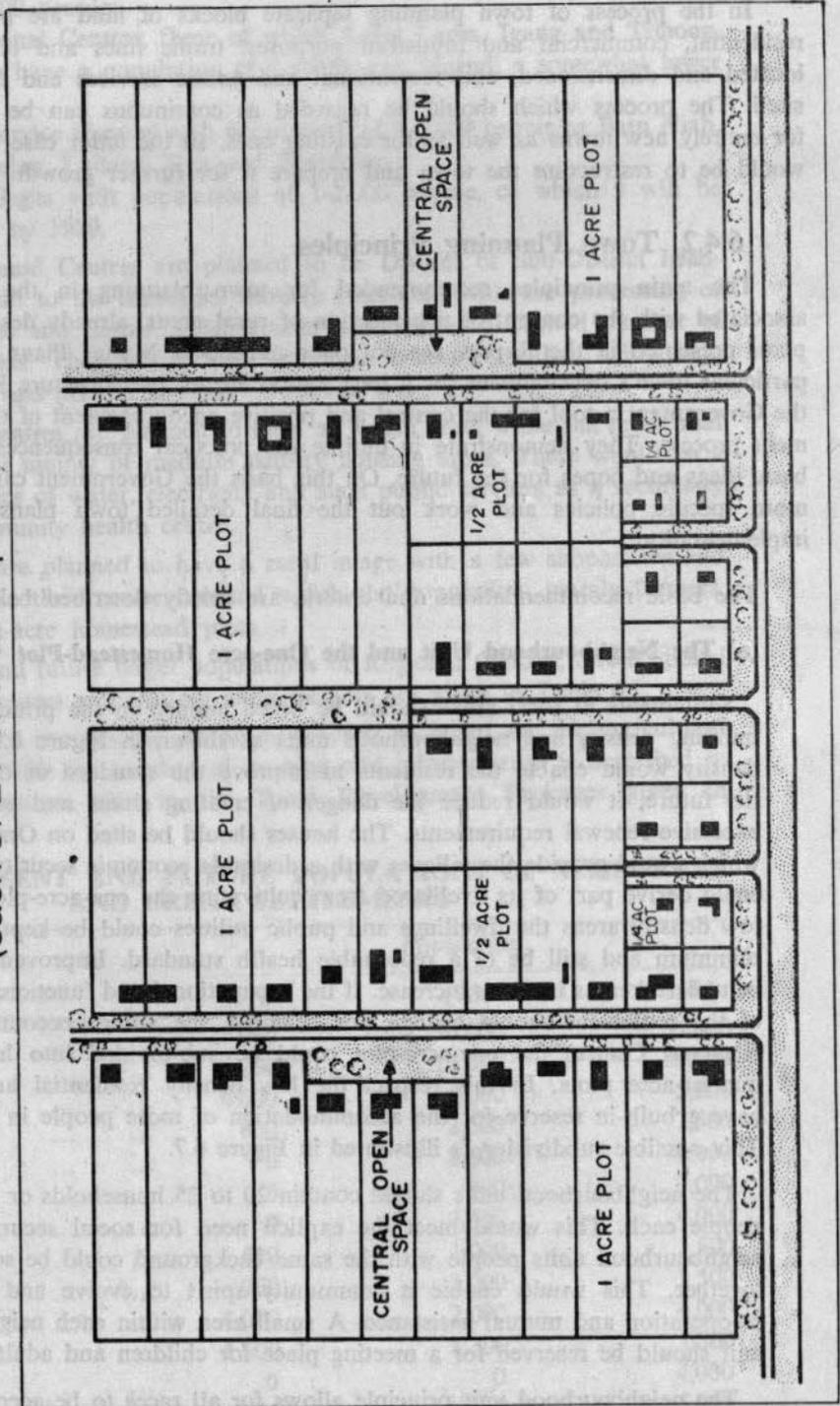
Settlements in rural areas should be based mainly on the principle of low building density and neighbourhood units as shown in Figure 6.7. The low density would enable the residents to improve the standard of dwellings in the future, it would reduce the danger of creating slums and would avoid excessive renewal requirements. The houses should be sited on One-acre-Plots which would provide the villages with a desirable economic security. A family could derive part of its livelihood from cultivating the one-acre-plot. In these low density areas the dwellings and public utilities could be kept to a basic minimum and still be of a reasonable health standard. Improvements could be undertaken as incomes increase. If the occupational and functional structure of the settlement should change (for example, the village becoming a Sub-Regional Centre) the one-acre-plot could be sub-divided into half-acre or quarter-acre plots. In this respect the low density residential areas would have a built-in reserve for the accommodation of more people in the future. This possible subdivision is illustrated in Figure 6.7.

The neighbourhood units should contain 20 to 25 households or 100 to 150 people each. This would meet the explicit need for social security. In the neighbourhood units people with the same background could be settled close together. This would enable a community spirit to evolve and encourage co-operation and mutual assistance. A small area within each neighbourhood unit should be reserved for a meeting place for children and adults.

The neighbourhood unit principle allows for all races to be accommodated easily in the new settlements. The integration of the settlers in the new societies should be taken care of by the sociologists working in State Manpower Section, described in Chapter 2.

FIGURE 6-7

2 NEIGHBOURHOOD UNITS  
(each of 24 one acre plots)



### **(b) Differentiation and Integration of Functions**

The various functional uses of town land should be separated whenever possible; for example industries causing pollution should be isolated from residential areas; but, on the other hand, access from residential areas to shopping centres and schools should be easy, and provision should be made for some people to live in the shopping, administration and service areas to prevent their dying out after closing time.

### **(c) Flexibility**

A town should be pleasant to live in at all stages of development, and it should be so planned that it is easy to expand without the need to pull down existing structures or damage natural assets.

## **6.4.3 Structure Plans**

Structure Plans have been worked out for the various types of new urban settlements, but for the Regional Centres, Miri and Bintulu, only outline plans have been prepared because more comprehensive planning of these towns is a separate and particular task demanding a considerable input of work. Summaries and illustrations of the recommended Structure Plans are given below; details are presented in Supporting Report 5.

The Structure Plans will need to be adapted to the actual landscape where the town or village is to be actually situated, and to the individual activities which create it and develop in it.

The present shortage of town planners in Sarawak is a real constraint for the orderly completion of all this work. Therefore it will be necessary to increase training of staff. If this is slow in materialising it is suggested that expatriate teams are employed to overcome the shortage.

The gross area required for each new town or village is specified in the Town Development Packages presented in Annexure II. The Town Development Packages also specify the physical requirements, costs and phasing of town development during the Action Programme period. The area requirements for each type of urban infrastructure such as schools, hospitals, roads and recreation facilities are contained in Supporting Report 6.

## **Villages**

The basic structure plan shown in Figure 6.8 is designed for:

- (a) a target population of about 2,000 people, mostly smallholder families living on one-acre-homestead-plots and farming a total of approximately 5,000 acres of agricultural land around the village;
- (b) a centre consisting of a primary school, a bazaar (five or six shops and coffee houses), a market place and a community hall;
- (d) a recreation area.

In the village about 90 per cent of the population would be occupied in agriculture and the remainder in the abovementioned public and private services.

## Service Centres

The basic structure plan is shown in Figure 6.9. A Service Centre would be mutually associated with three to five nearby villages and would be designed for:

- (a) a target population of 4-6,000;
- (b) an area sufficiently large to accommodate agricultural workers from the estates in medium density housing (1/4 acre plots), maintaining the neighbourhood unit principle;
- (c) a central area with an urban image which would include schools, health institutions, shops, small-scale manufacturing industries and workshops.

Agricultural processing facilities, timber complexes and possibly other medium-scale industries would usually be located in the Sub-Regional Centres and not in the Service Centres.

The employment structure of a typical fully developed Service Centre is indicated below. The people employed in agriculture would be mainly associated with working about 10,000 planted acres of estate-type farming.

### TYPICAL ULTIMATE EMPLOYMENT STRUCTURE OF A SERVICE CENTRE

Sector					Number of Employed	Percentage
Agriculture	...	...	...	...	1,300	63
Manufacturing	...	...	...	...	180	8
Services	...	...	...	...	600	29
Total	...	...	...	...	2,080	100

## Sub-Regional Centres

The basic structure is shown in Figure 6.10. It is designed for:

- (a) a target population of 7-10,000;
- (b) separate residential areas of high, medium and low density housing;
- (c) special areas for industries;
- (d) three centres each with a wide range of shops, services, entertainment, education and recreation facilities.

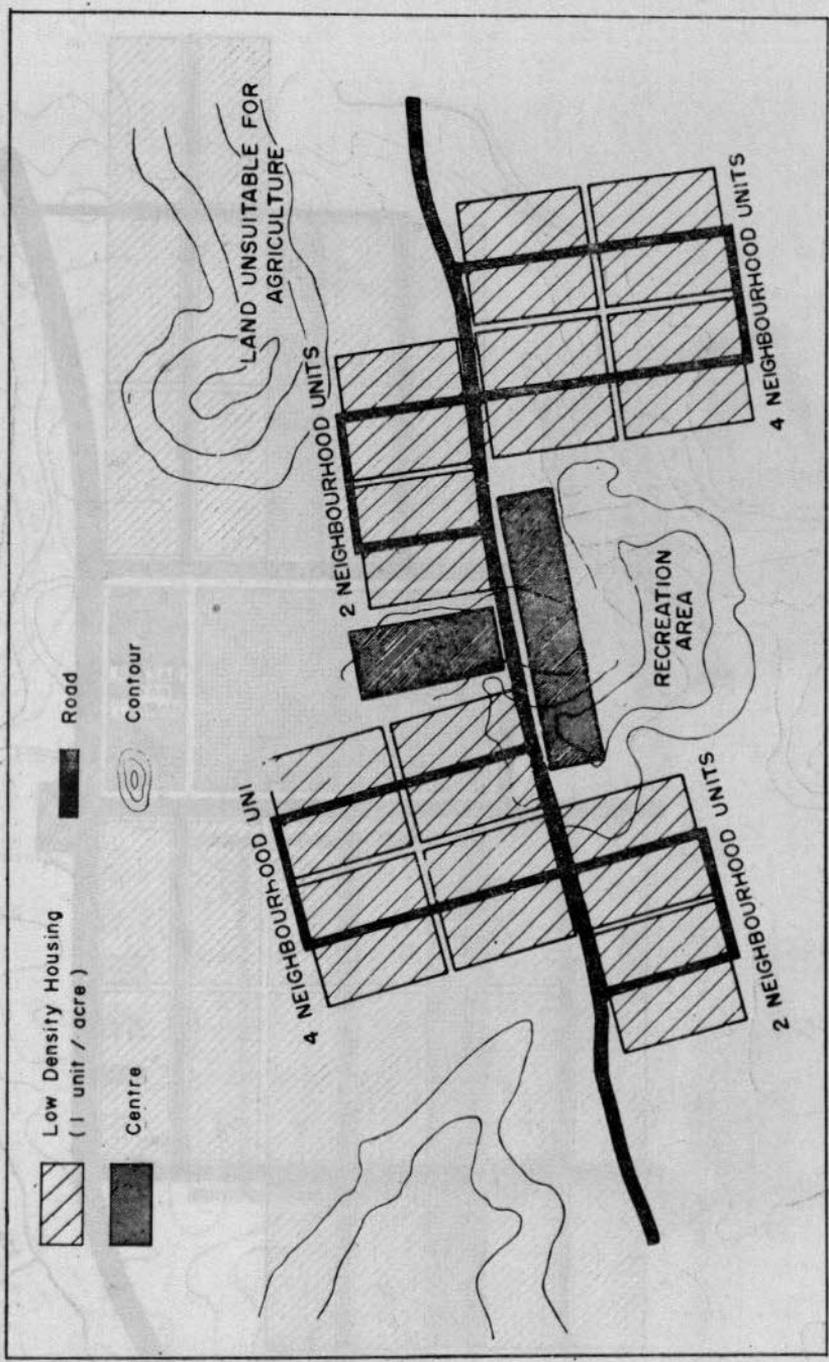
The expected employment structure of Igang, the Sub-Regional Centre in the Niah-Suai RDA, when fully developed is given below. The employment created by a timber complex is included in the figures.

### EXPECTED EMPLOYMENT STRUCTURE OF IGANG SUB-REGIONAL CENTRE BY 1990

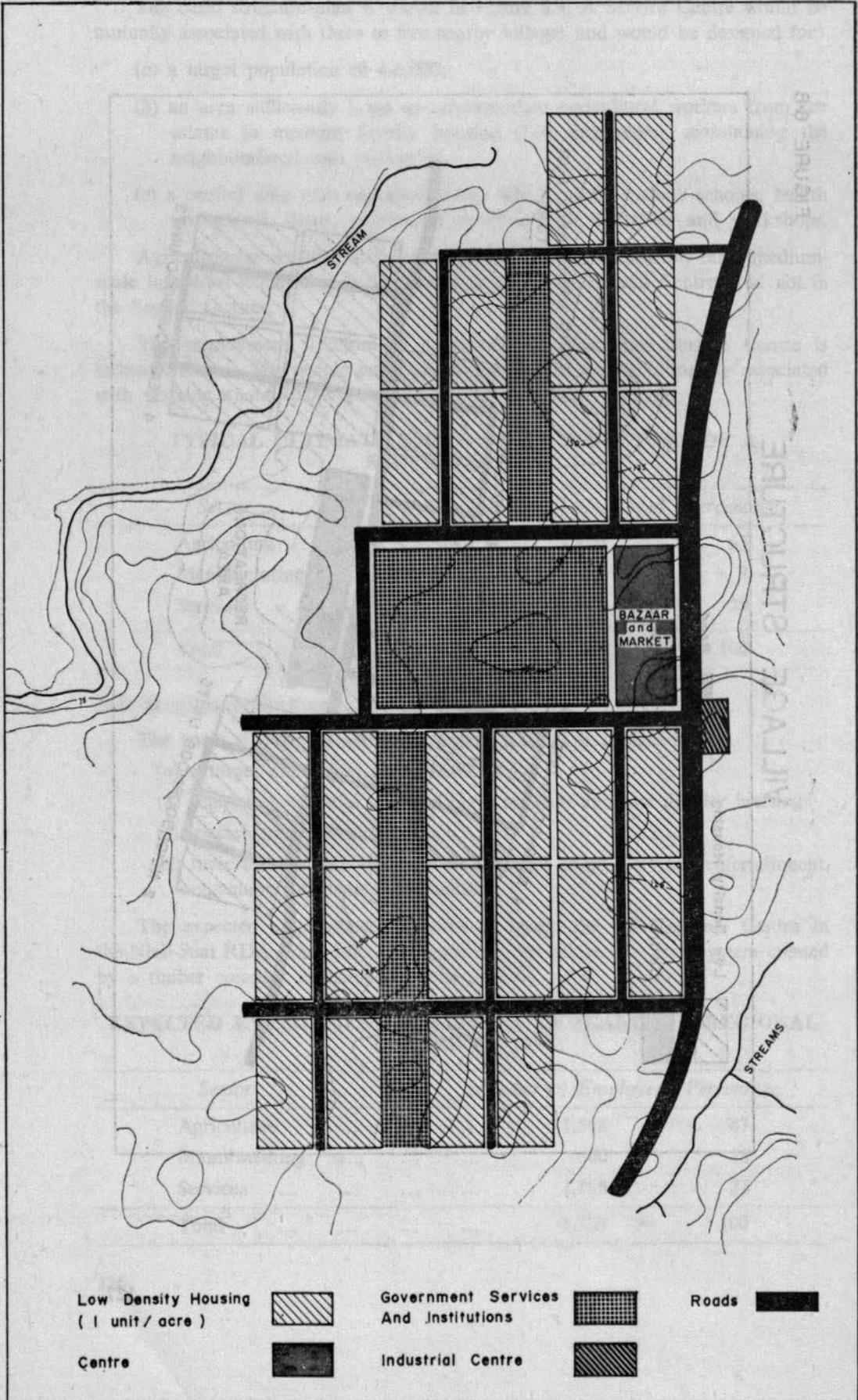
Sector					Number of Employed	Percentage
Agriculture	...	...	...	...	1,568	47
Manufacturing	...	...	...	...	600	18
Services	...	...	...	...	1,165	35
Total	...	...	...	...	3,333	100

FIGURE 6-8

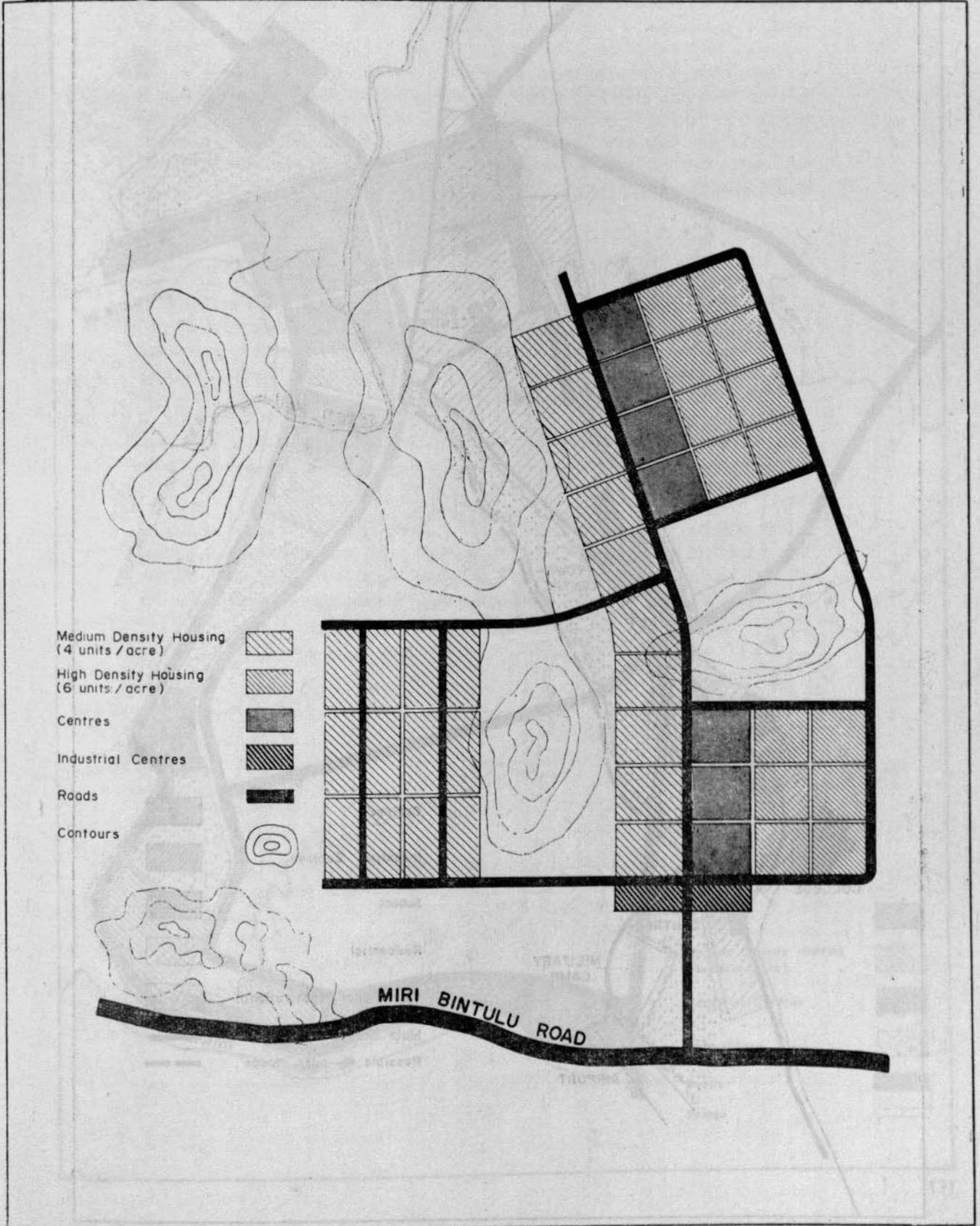
# VILLAGE STRUCTURE



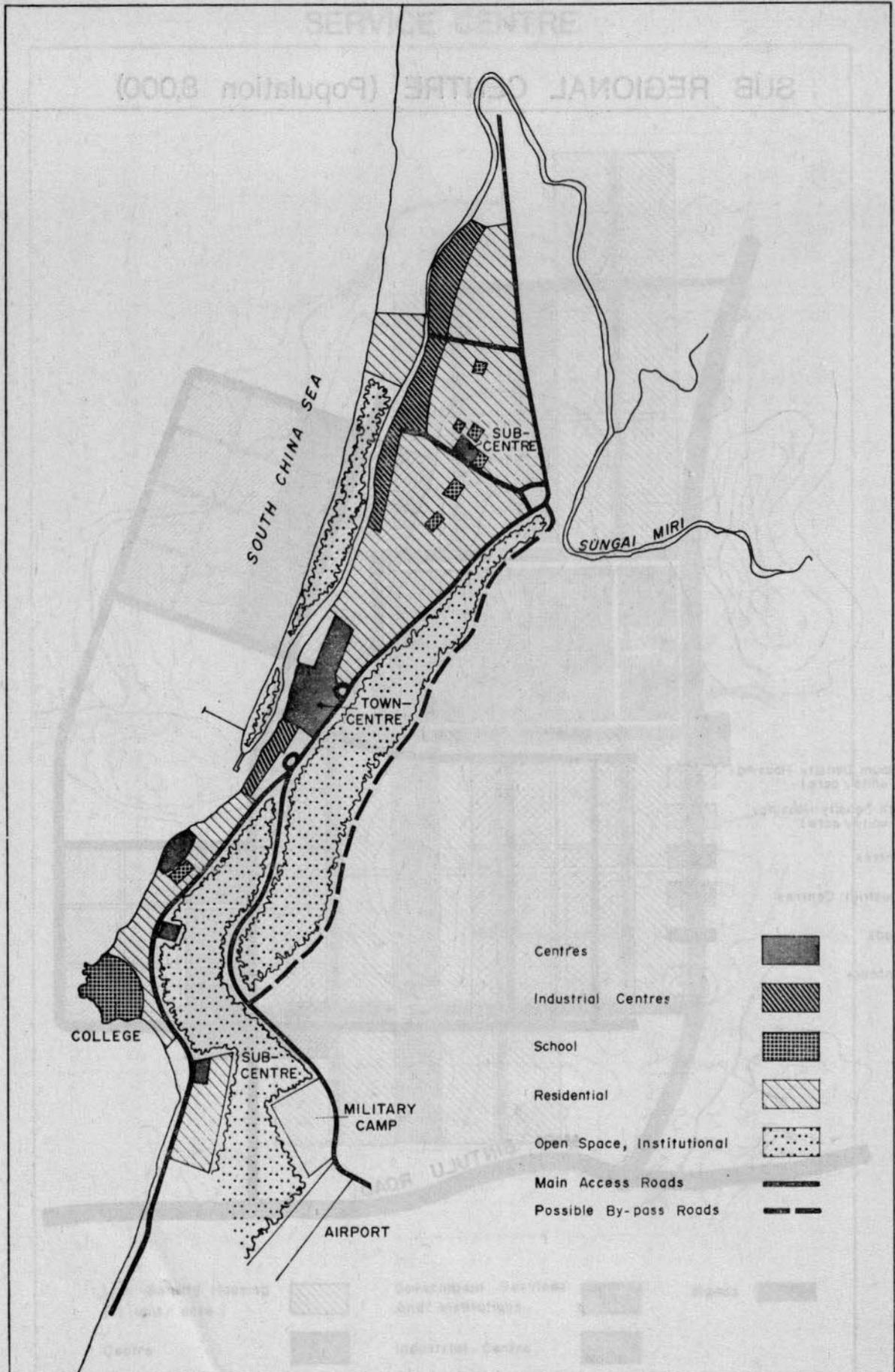
# SERVICE CENTRE



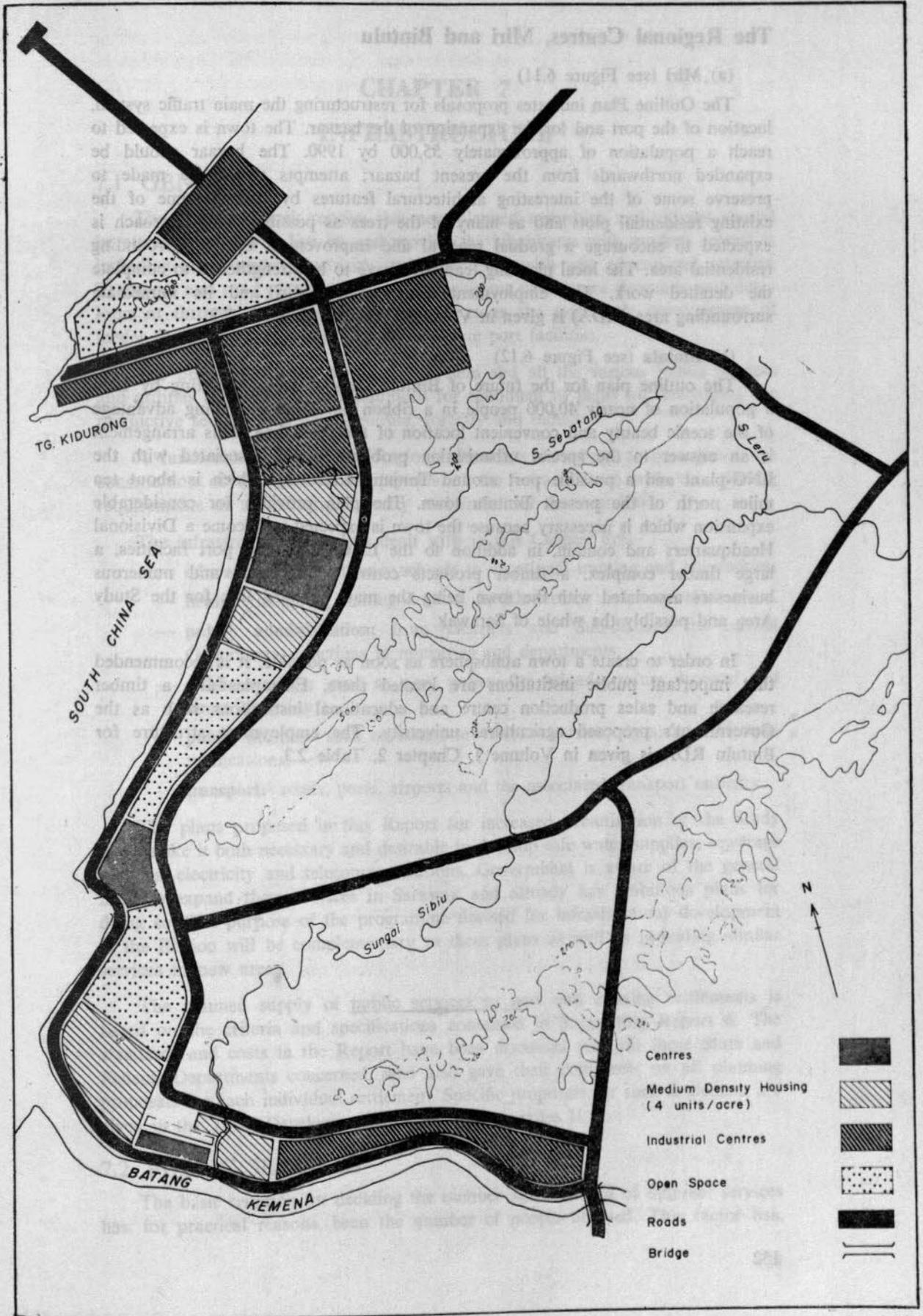
### SUB REGIONAL CENTRE (Population 8,000)



DRAFT OUTLINE PLAN - MIRI



DRAFT OUTLINE PLAN — BINTULU 1990



### The Regional Centres, Miri and Bintulu

(a) **Miri** (see Figure 6.11)

The Outline Plan indicates proposals for restructuring the main traffic system, location of the port and for the expansion of the bazaar. The town is expected to reach a population of approximately 55,000 by 1990. The bazaar should be expanded northwards from the present bazaar; attempts should be made to preserve some of the interesting architectural features by leaving some of the existing residential plots and as many of the trees as possible. This approach is expected to encourage a gradual renewal and improvement of the surrounding residential area. The local planning team will have to be strengthened to complete the detailed work. The employment structure for Miri and its immediate surrounding area (RDA) is given in Volume I, Chapter 2, Table 2.2.

(b) **Bintulu** (see Figure 6.12)

The outline plan for the future of Bintulu aims at accommodating by 1990 a population of nearly 40,000 people in a ribbon development, taking advantage of the scenic beauty and convenient location of the coast line. This arrangement is an answer to the special urbanisation problems posed associated with the LNG-plant and a possible port around Tanjung Kidurong, which is about ten miles north of the present Bintulu town. The plan provides for considerable expansion which is necessary because the town is expected to become a Divisional Headquarters and contain, in addition to the LNG plant and port facilities, a large timber complex, a timber products centre, a university and numerous businesses associated with the town being the main seaward link for the Study Area and possibly the whole of Sarawak.

In order to create a town atmosphere as soon as possible, it is recommended that important public institutions are located there. Examples are, a timber research and sales production centre and educational institutions such as the Government's proposed agricultural university. The employment structure for Bintulu RDA is given in Volume I, Chapter 2, Table 2.3.



## CHAPTER 7

### INFRASTRUCTURE

#### 7.1 GENERAL

The Scope of Work require that new planned townships and villages should be attractive places to live in, and provide the inhabitants with modern amenities including clean water, electricity and adequate health and educational services. Transport and road planning should be consistent with future demands and development throughout the State and should cover the systematic development of feeder roads and the construction of adequate port facilities.

The provision of a transportation system and all the various public services and utilities are necessary preconditions for fulfilment of plans for developing the productive sectors such as agriculture, forestry and industry.

A fundamental aim of the Regional Plan has thus been to co-ordinate the construction of the various components of the infrastructure with the phasing requirements of agricultural, forestry and industrial development.

The infrastructural elements dealt with in this Chapter are:

- **education:** from primary schools to vocational training and universities;
- **health:** including visiting doctors, health centres and hospitals;
- **public administration:** from Districts and Sub-districts to central Government functions in ministries and departments;
- **public services:** such as post, police, fire brigade, refuse disposal and street cleansing;
- **public utilities:** such as water, sewerage, electricity (gas) and telecommunications;
- **transport:** roads, ports, airports and the associated transport industry.

The plans proposed in this Report for increased urbanisation of the Study Area make it both necessary and desirable to develop safe water supplies, sewerage systems, electricity and telecommunications. Government is aware of the general need to expand these services in Sarawak and already has ambitious plans for doing so. The purpose of the programme devised for infrastructural development in the Region will be complementary to these plans as well as providing similar services in new areas.

The planned supply of public services to new and existing settlements is based on the criteria and specifications contained in Supporting Report 6. The standards and costs in the Report have been discussed with all those State and Federal Departments concerned, who also gave their comments on all planning proposals for each individual settlement. Specific proposals for each settlement are given in the Town Development Packages in Annexure II.

#### 7.2 PUBLIC SERVICES

The basic criterion for deciding the number and standard of different services has, for practical reasons, been the number of people affected. This factor has,

however, been modified by other criteria such as the level of social and economic activity, the character of the transport network, the density and distribution of the population, the security situation and Government preferences for the development and upkeep of certain areas. It is expected that the relative importance of these criteria will change over time and will require regular review.

The principle adopted in locating the hierarchy of services is that the highest level of each different service type should be sited in the main town of the area, the second highest level in services of a lower order, and so on. Co-ordinating the location of different levels of services in this way will facilitate co-operation between the Government Departments and could conform with the future division of the State into Administrative Districts and Sub-districts.

For the different types of amenities in Sarawak various service levels have been established in the past related to rough population thresholds. These continue to be present target standards applied by the authorities concerned and are shown in Table 7.1. In formulating the Plan, however, it has not been possible to apply these standards rigidly because it would have resulted in a network of services too expensive for implementation at this stage. Thus there has been an adjustment in applying the standards resulting generally in a lower service level.

The settlement system in future agricultural areas is designed to contain one centrally located town with several surrounding satellite villages within a radius of five to seven miles. The service level in these villages has been kept at a basic minimum, consisting in the villages of only a primary school, a village police post, a postal agent, a community hall and a few shophouses. Higher order services are only proposed for the central town of each RDA. A public bus system connecting the settlements is proposed so that the village population can make use of the facilities in the town.

In Sarawak the public services and utilities are organised under a number of separate bodies, and no alterations to this system are needed. But the Plan proposes a substantial increase and improvement in many public services throughout the Region in the AP-period, namely:

- 40 primary and secondary school streams;
- 6 kindergartens;
- 2 vocational schools and a Junior College;
- 2 General Hospitals and 3 Community Health Centres;
- 5 post offices and 14 new postal agencies;
- 7 new police stations;
- 3 new Sub-district Offices, and new Government complexes in Miri and Bintulu;
- 12 Community halls;
- 16 new religious buildings.

The programmes for the more important of these services are briefly described below. Details are given in Supporting Report 5.

### 7.2.1 Health Services

The proposed programme for development of health facilities during the AP-period is shown below: while the estimated annual costs are given in Table 7.2.

TABLE 7.1 EXISTING POPULATION THRESHOLDS FOR PUBLIC SERVICES<sup>(1)</sup>

Population	Education	Health	Government Administrative Offices	Local Councils	Postal	Police
50,000		District Health Centre				
45,000	Pre-University Level		District Office			
30,000						
25,000						
20,000						
15,000	Upper Secondary School		Sub-district Office	District Council	Class A Post Office	District Police Station
10,000						
7,500	Lower Secondary School	Health Sub-centre			Class B Post Office	Minor Police Station
5,000					Class C Post Office	Police Post
1,500	Primary School	Community Health Centre			Class C Phase I Postal Agent	Village Post

(1) The term 'District' in this table is used by various public agencies to denote service levels related to different population thresholds.

<i>Type of Medical Facility</i>	<i>Proposed Location</i>	<i>Scheduled Start of Construction</i>
Community Health Centres	Ladang Tiga Village in Lambir-Subis RDA	Mid-1975
	Igang Sub-Regional Centre in Niah-Suai RDA	Mid-1977
	Beluru Village in the Lambir-Subis RDA	1978
General Hospital	Miri town	1975
	Bintulu town	1977

The hospital in Miri is to replace the existing old one which will be slowly phased out. The other developments will be in addition to the present facilities which include:

- the hospital in Miri with its substantial range of facilities and trained staff;
- private medical and dental practitioners in Miri;
- either a Community Health Centre or Health Sub-centre at Bintulu, Marudi, Long Lama and near Kabuloh in the Lambir-Subis Area.

**TABLE 7.2 ESTIMATED ANNUAL COSTS OF NEW MEDICAL FACILITIES**

<i>Estimated Annual Cost of Facilities Commenced in Specified Year (\$000)</i>							
	1975	1976	1977	1978	1979	1980	Total
	72	70	—	—	—	—	142
	—	—	—	—	—	—	—
	—	—	3,142	3,000	3,000	3,000	12,142
	—	—	—	2,142	2,000	2,000	6,142
	—	—	—	—	—	—	—
	—	—	—	—	—	—	—
<b>Total:</b>	72	70	3,142	5,142	5,000	5,000	18,426

### 7.2.2 Education Services

The locations and phasing of the proposed development of education facilities during the AP-period are shown in Table 7.3. The estimated annual costs of these increases are given in Table 7.4. These facilities are all in addition to the existing schools of which the Study Area is quite well endowed. Almost every large longhouse and village have primary schools, and there are secondary schools with boarding facilities at Miri (several schools), Bintulu and Marudi.

The University of Bintulu is being planned jointly by the Federal and Sarawak Governments. The Vocational training schools are the responsibility of the Federal Ministry of Labour and Manpower. The expected basis of the vocational school at Miri is given below. This is scheduled for 1975 and the one in Bintulu, which is expected to be similar, is scheduled for 1979.

**TABLE 7.3 THE LOCATION AND PHASING OF PROPOSED NEW EDUCATION FACILITIES**

<i>Year</i>	<i>Location of Facility</i>	<i>Specification</i>
1975	Ladang Tiga (Lambir-Subis RDA)	Primary School, 1 stream.
	Subis I Village (Lambir-Subis RDA)	Primary School, 1 stream.
	Subis II Village (Lambir-Subis RDA)	Primary School, 1 stream.
	Bukit Peninjau (Lambir-Subis RDA)	Primary School, 1 stream.
	Bukit Peninjau (Lambir-Subis RDA)	Lower Secondary School, 2 streams.
	SOP Village (Lambir-Subis RDA)	Primary School, 1 stream.
	Bintulu	Primary School, 2 streams.
	Long Lama	Lower Secondary School, 2 streams.
	Miri	Vocational School.
1976	Sebauh (Labang-Tubau RDA)	Lower Secondary School, 2 streams.
	Bintulu	Kindergarten.
	Bintulu	Lower Secondary School, 2 streams.
	Miri	Kindergarten.
1977	Mera-a (Lambir-Subis RDA)	Primary School, 1 stream.
	Sepupok (Niah-Suai RDA)	Primary School, 1 stream.
	Miri	Primary School, 2 streams.
	Bintulu	University Complex.
	Miri	Kindergarten.
1978	Bintulu	Junior College.
	Igang (Niah-Suai RDA)	Primary School, 1 stream.
	Bintulu	Primary School, 1 stream.
	Bintulu	Kindergarten.
1979	Labang (Labang-Tubau RDA)	Lower Secondary School, 2 streams.
	Batu Niah (Niah-Suai RDA)	Primary School, 1 stream.
	Marudi	Primary School, 1 stream.
	Miri	Primary School, 2 streams.
	Ladang Tiga (Lambir-Subis RDA)	Lower Secondary School, 2 streams.
	Galasah (Niah-Suai RDA)	Primary School, 1 stream.
	Sebanah (Niah-Suai RDA)	Primary School, 1 stream.
	Miri	Lower Secondary School.
Long Lama	Primary School, 1 stream.	
1980	Lamaus (Niah-Suai RDA)	Primary School, 1 stream.
	Bintulu	Primary School, 2 streams.
	Bintulu	Vocational School.
	Miri	Kindergarten.
	Bintulu	Kindergarten.
1980	Igang (Niah-Suai RDA)	Primary School, 1 stream.
	Igang (Niah-Suai RDA)	Lower Secondary School, 2 streams.
	Ensabang (Niah-Suai RDA)	Primary School, 1 stream.
	Miri	Primary School.
	Marudi	Lower Secondary School, 2 streams.
	Miri	Kindergarten.

**TABLE 7.4 ESTIMATED ANNUAL COSTS OF NEW EDUCATION FACILITIES**

<i>Estimated Annual Cost of Facilities Commenced in Specified Year (\$000)</i>							
	1975	1976	1977	1978	1979	1980	Total
	4,945	376	—	—	—	—	5,321
	—	2,978	1,000	1,000	1,000	1,000	6,978
	—	—	3,688	2,300	—	—	5,988
	—	—	—	4,142	325	—	4,467
	—	—	—	—	1,438	777	2,215
	—	—	—	—	—	2,528	2,528
<b>Total:</b>	4,945	3,354	4,688	7,442	2,763	4,305	27,497

**(a) Enrolment**

Total enrolment of 300 students (180 boarders) distributed as follows:

- 60 Mechanical Engineering Craft Practice
- 60 Electrical Installation Technology
- 60 Automotive Engineering Craft Practice
- 60 Welding/Sheet Metal
- 60 Commerce (shorthand-typist, copy-typist).

**(b) Annual Output**

Output starting from 1978 will be about 140 annually, consisting of:

- 20 Mechanical
- 20 Electrical
- 20 Automotive
- 20 Welding/Sheet Metal
- 60 Commerce

**(c) Entry Qualification and Final Examination**

The entry qualification for the trade and copy-typist courses is the Sarawak Junior Certificate, and for the Shorthand-typist course the Overseas School Certificate/MCE.

Trade students are prepared for the City and Guilds of London Institute Examination, and Commerce students (shorthand and copy-typist) for the London Chamber of Commerce Examinations.

**(d) Length of Course**

- Trade courses = 3 years.
- Commerce = 1 year.

**(e) Number of Teachers/Instructors: 25.**

## 7.3 PUBLIC UTILITIES

### 7.3.1 Water Supply Schemes

Twelve separate water supply schemes summarised in Table 7.5 will be required in connection with 14 towns or bazaars and four groups of agricultural villages. Further data on the works needed for each scheme are given in Supporting Report 10, and in the Development Packages presented in Annexure II. The locations of the places listed in Table 7.5 are shown on Figure 7.1.

TABLE 7.5 WATER SUPPLY SCHEMES

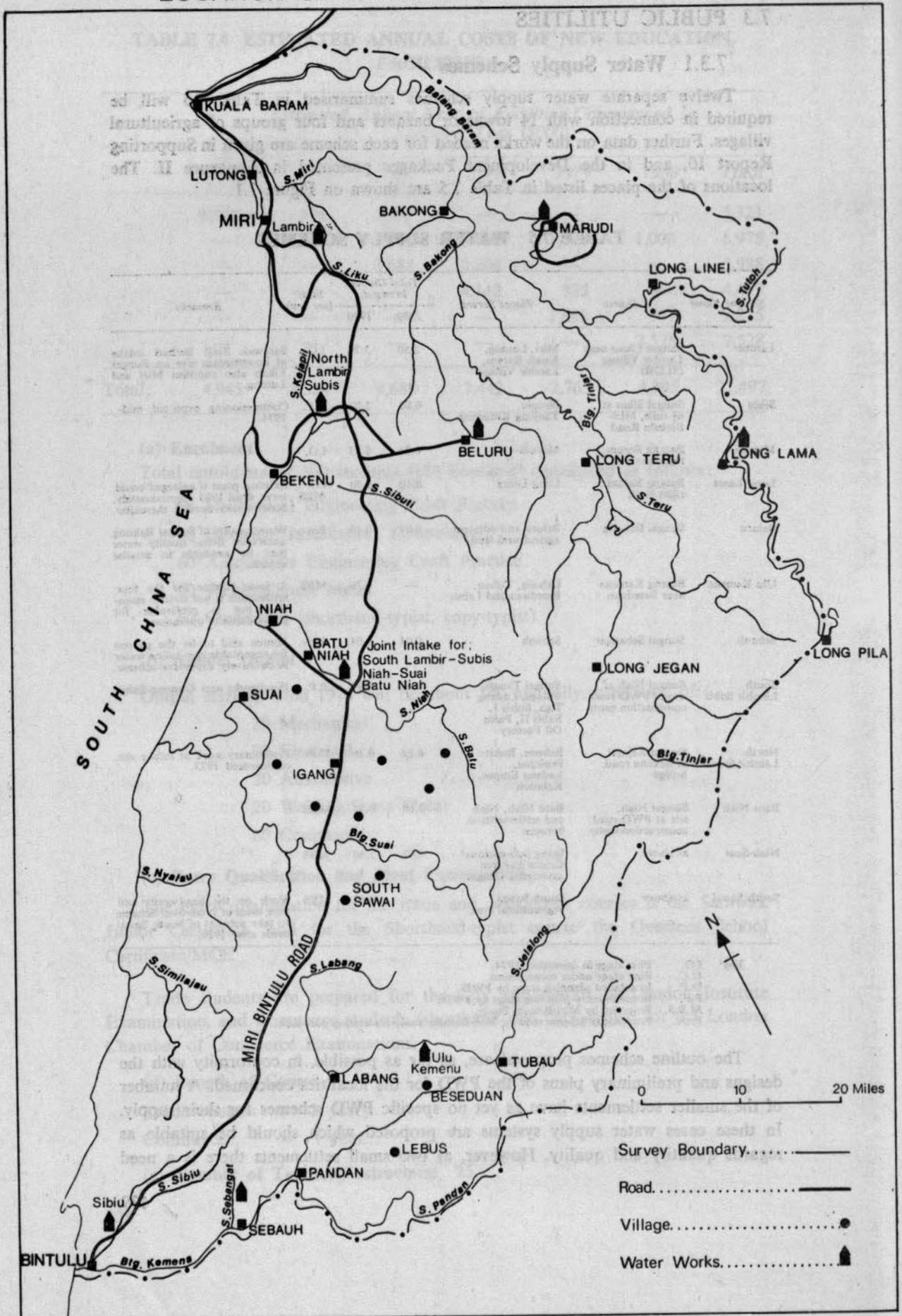
Scheme Name	Source	Places Served	Total Output in m.g.d.		State (see key)	Remarks
			1980	1990		
Lambir	Sungai Likau near Lambir Village (SLDB)	Miri, Lutong, Kuala Baram, Lambir Village	2.50	3.70	I.O.	Sarawak Shell Berhad intake at downstream site on Sungai Likau also supplies Miri and Lutong.
Sibiu	Sungai Sibiu at 6½ mile, Miri-Bintulu Road	Bintulu, Tanjong Kidurong	0.80	2.20	U.C.	Commissioning expected mid-1974.
Marudi	Batang Baram right bank	Marudi	0.21	0.25	I.O.	
Long Lama	Batang Baram right bank	Long Lama	0.10	0.30	I.O. MBS	Existing plant if enlarged could serve until 1985 approximately. New works needed thereafter.
Beluru	Sungai Bakong	Beluru and adjacent agricultural land	0.08	0.10	Prov.	Water quality of Sungai Bakong uncertain. Better quality water may be available in smaller stream.
Ulu Kemena	Batang Kemena near Beseduan	Labang, Tubau, Beseduan and Lebus	—	0.26	MBS	A joint scheme for the four settlements is not strictly essential, but is preferable for convenience of operation.
Sebauh	Sungai Sebangat	Sebauh	0.03	0.04	Prov.	Source said to be the nearest for acceptable non-saline water. A relatively expensive scheme.
South Lambir Subis	Sungai Niah at site of PWD road construction camp	Sungai Tangit Village, Ladang Tiga, Subis I, Subis II, Palm Oil Factory	0.82	0.90	P.P.	Headworks near Gunong Subis.
North Lambir Subis	Sungai Kejapil at Bekenu road bridge	Bekenu, Bukit Peninjau, Ladang Empat, Kebuloh	0.19	0.26	D.P.	Preliminary work at intake site commenced 1973.
Batu Niah	Sungai Niah, site at PWD road construction camp	Batu Niah, Niah and settlements in between	0.14	0.27	MBS	
Niah-Suai	as above	Igang Sub-regional Centre and five associated villages	0.67	1.40	MBS	
South Sawai	as above	South Sawai Agricultural area	—	0.40	MBS	Work on the headworks and pipe lines of Niah-Suai Scheme to take account of South Sawai needs after 1980.

Key<sup>a</sup>

- I.O. First stage in operation 1974.
- U.C. First stage under construction.
- D.P. In detailed planning stage by PWD.
- P.P. In preliminary planning stage by PWD.
- M.B.S. Proposed by Miri-Bintulu Study.
- Prov. Provisional Scheme used by Miri-Bintulu Study for costing purposes.

The outline schemes proposed are, as far as possible, in conformity with the designs and preliminary plans of the PWD for the localities concerned. A number of the smaller settlements have as yet no specific PWD schemes for their supply. In these cases water supply systems are proposed which should be suitable as regards quantity and quality. However, at two small settlements there is a need

LOCATION OF WATER SUPPLY HEADWORKS



for studies at the site before making even preliminary recommendations. These settlements are Beluru and Sebauh, of which further details are given in Supporting Report 5.

### 7.3.2 Sewerage and Sewage Disposal

#### (a) Existing Situation

Generally the present sewage disposal facilities are inadequate throughout much of the Study Area. In the towns reliance is placed on the use of septic tanks from which highly polluting liquors flow into surface drains and water courses. Because of the high watertable in the plains, it is not possible for effluent from the tanks to percolate into the ground, and filter beds, which are provided to treat the effluent, generally serve little or no purpose because of bad design or lack of maintenance. Consequently, the ground may become saturated with effluent and some surface water drains become fouled and evil smelling.

Although septic tanks serve a useful purpose in low density housing areas where sufficient land is available for the effluent to be disposed of without danger of nuisance, in urban areas the only satisfactory sewage disposal method is by the provision of sewers to carry the wastes away for treatment and safe disposal.

#### (b) Criteria for Future Construction and Operation

It is recommended that for development purposes the various settlements should be divided into four categories of building density:

<i>Housing Density</i>	<i>Housing Units per net acre</i>	<i>Average Persons per net acre</i>
Low	1	6
Medium	3-4	15-20
High	6	31
High	6-10	30-55

Sewer systems should be installed in all high density residential areas and bazaars as early as possible. The completion by 1980 of this programme is included in the financial projections of the Action Programme. In medium housing density areas septic tanks would be satisfactory and allowance has been made in the economic projections for new houses in such areas to be provided with septic tanks. Facilities are also urgently needed for desludging both the existing and the new septic tanks, a process which should be carried out every one to two years, and for this purpose allowance has been made for the provision of mechanical septic tank emptying vehicles.

In very low density housing areas such as agricultural villages pit latrines will be adequate for most of the houses and allowance has been made in the estimates for this at each new house. Community sewerage systems are included in the Plan for each village to serve the school, community hall and bazaar. Typical layouts of treatment works designed to cater for populations of up to 300 are illustrated in Supporting Report 6. Phasing of these works and specific recommendations for each settlement are included in the Town Development Packages in Annexure II and in Supporting Report 5.

### 7.3.3 Drainage, Cleansing and Street Lighting

The services considered here include:

- (a) Construction and maintenance of surface channels for conveying water from all sources.
- (b) Operation and maintenance of refuse collection services.
- (c) Cleansing of streets, drains and public paved areas; including market places.
- (d) Street lighting (maintained by SESCO through a tariff charge on the local authority).

These services should be supplied to varying degrees in all towns in the Study Area. The larger the town the higher should be the level of service. Their operation imposes considerable responsibilities upon District Councils, and these councils require to have powers to raise sufficient revenue to provide an adequate service.

Expenditures on these services under District Council control are not expected for agricultural villages or bazaars with populations less than 800. However, items (a) and (b) above and to a small extent item (c) require to be organised in villages by committees. Similarly, in very small bazaars some form of voluntary or co-operative effort is needed to keep drains operating effectively and to ensure that refuse is disposed of and the public areas kept clean.

The cost of these services in all large communities should be met from annual taxes or rates on property. It is estimated that a charge of about \$4.00 per head per year in bazaars of one or two thousand people would be adequate. But in a town like Miri about \$9.50 per head per year would be required.

### 7.3.4 Electricity Supplies

At present only the towns of Miri, Bintulu and Marudi have electricity supplied by the Sarawak Electricity Supply Corporation (SESCO). But many small villages and bazaars have electricity supplied by private licencees. It is Government policy and is incorporated in the Regional Plan that all settlements, including agricultural villages, having populations in excess of 1,000 should, in due course, be supplied with electricity by SESCO. Where possible the SESCO supplies should also extend to the smaller villages.

The general conclusions concerning future supplies after discussions with SESCO engineers are as follows:

- (a) It will not be economically feasible to provide inter-connecting transmission lines between settlements, since all are small and widely separated, within the next 15 to 20 years.
- (b) Each of the smaller towns and settlements should have separate power stations with generators driven by diesel engines.
- (c) All new electricity systems should, in accordance with Government policy, be installed and operated by SESCO, who should take over private systems as and when licencees expire.

Estimates of future electricity demands have been made in Supporting Report 5 for the larger centres, a summary is given in Table 7.6.

**TABLE 7.6 PRESENT AND ESTIMATED FUTURE ELECTRICITY REQUIREMENTS IN THE LARGER CENTRES**

<i>Town</i>	<i>Planned Installed Capacity by 1974</i>	<i>Estimated Requirement by 1980</i>
Miri	9.7 megawatts	19.7 megawatts
Bintulu	2,355 kilowatts	5,355 kilowatts
Marudi	410 kilowatts	910 kilowatts
Batu Niah	60 kilowatts	320 kilowatts
Long Lama	practically nil	150 kilowatts
Bekenu	30 kilowatts	90 kilowatts

Electricity supplies for the planned new settlements have been estimated in accordance with criteria given in Supporting Report 6. Apart from the Sub-regional centre, Igang, the timing of the installation of these systems is open to wide variation, depending on the resources available.

The Development Packages presented in Annexure II show when the particular towns could with benefit have electricity systems. In the case of Igang an adequate power supply will be essential from the end of 1977 if the Centre is to grow as envisaged in the Plan and meet the needs of the surrounding agricultural area. In Table 7.7 a summary is given of the phasing of electricity installation and in Table 7.8 the estimated annual investment costs.

Bintulu is the nearest load centre to a site for possible hydro-electric generation on the Belaga river in the Seventh Division. However, this site is some 90 miles away, it is not at present possible to foresee a demand sufficient to justify a scheme to exploit the river potential which is of the order of 250 megawatts. Further investigation of this matter is required as soon as the rate of growth of Bintulu demand becomes clearer.

**TABLE 7.7 SUMMARISED PHASING OF ELECTRICITY INSTALLATION**

<i>Town or Village</i>	<i>Investment and Installation Period</i>						
	1974	1975	1976	1977	1978	1979	1980
<i>Existing Places</i>							
Miri	_____	_____	_____	_____	_____	_____	→
Bintulu	_____	_____	_____	_____	_____	_____	→
Marudi	_____	_____	_____	_____	_____	_____	→
Batu Niah	_____	_____	_____	_____	_____	_____	→
Long Lama	_____	_____	_____	_____	_____	_____	→
Bekenu	_____	_____	_____	_____	_____	_____	→
Beluru	_____	_____	_____	_____	_____	_____	→
Sebauh	_____	_____	_____	_____	_____	_____	→
Labang	_____	_____	_____	_____	_____	_____	→
Tubau	_____	_____	_____	_____	_____	_____	→
Niah	_____	_____	_____	_____	_____	_____	→
<i>New Settlements</i>							
Lambir-Subis South	_____	_____	_____	_____	_____	_____	→
Lambir-Subis North	_____	_____	_____	_____	_____	_____	→
Mera-a	_____	_____	_____	_____	_____	_____	→
Igang and associated villages	_____	_____	_____	_____	_____	_____	→

**TABLE 7.8 ESTIMATED ANNUAL COSTS OF NEW ELECTRICITY INSTALLATION**

<i>Estimated Annual Costs of Installation Commenced in Specified Year</i>							
	1975	1976	1977	1978	1979	1980	Total
	3,786	3,725	3,862	3,758	2,001	2,048	19,180
	—	300	—	380	645	650	1,975
	—	—	180	60	360	355	955
	—	—	—	420	—	60	480
	—	—	—	—	—	—	—
	—	—	—	—	—	240	240
<b>Total:</b>	<b>3,786</b>	<b>4,025</b>	<b>4,042</b>	<b>4,618</b>	<b>3,006</b>	<b>3,353</b>	<b>22,830</b>

### 7.3.5 Telecommunications

The general criteria for installing telecommunications are given in Supporting Report 6. Individual telephone lines form the largest and most important part of the service provided by the Telecommunications Department, and are the items which determines the size of the system. However, there are other services which are listed below; those at the top of the list being principally associated with the larger towns:

telex;

inland and overseas telegraph;

public call boxes;

radio telephone;

radio call service for remote settlements;

and special radio services for police, civil aviation and the civil administration.

A micro-wave link system is already in use between Kuching and Sibu, and is being extended through Third, Fourth and Fifth Divisions to Sabah. Micro-wave relay stations in the Study Area are listed below:

From Third Division (Balingian) to—

Bukit Nyabau (drop-off to Bintulu);

Mile 34 from Bintulu;

Bukit Ancharang (south of Batu Niah);

Bukit Lambir (drop-off to Miri);

Bukit Dabei (east of Marudi) leading to Fifth Division.

Most of the new settlements included in the Regional Plan will lie within a 20 to 25 mile radius of the Mile 34 or Bukit Ancharang stations, and it would be advantageous to have Drop-off facilities in future at one or both of these stations. At present these stations are planned as repeater stations only.

An accelerated economic growth is expected to take place at four locations already provided with telephone exchanges namely Miri/Lutong, Bintulu/Kidurong, Bekenu and Batu Niah. Growth is also expected at Long Lama and Beluru which at present have no telephone service. Development of telecommunication services will be required in all these places. In addition the planned new Sub-Regional Centre—Igang—in the Niah-Suai RDA and the surrounding villages should be supplied with a telephone service.

Of the above places Long Lama is the most remote from existing services and to connect it with Miri is expected to require one or more relay stations. However, these developments will not be required until after 1980 because little growth of Long Lama is expected until the road connection with Beluru is open. This is expected to be in 1977.

The locations of all the settlements mentioned are shown on the Regional Plan Map, their populations and telephone requirements are set out in Supporting Report 5, and summarised in Table 7.9. The costs and phasing of these are given in the Town Development Packages in Annexure II.

## 7.4 TRANSPORT

This section gives a summary of the future road network and the transport demand associated with the planned development. A more detailed description is given in Supporting Report 7. Recommendations concerning development and management of the transport industry, Ports and Airports are discussed in Volume I, Chapter 2.

### 7.4.1 Transport Demand

#### (a) Present Trade

The Study Area—in common with the rest of Sarawak and Peninsular Malaysia—has a strongly foreign trade oriented economy. For Sarawak as a whole export products contribute about 50 per cent of the total Gross Domestic Product (GDP). In 1960 exports were only 30 per cent of the import value; recently (1970 to 1975), however, the value of exports has increased to 50-55 per cent of that of imports. The present main products in the Study Area for which transport is required are:

- (i) **food** for subsistence and sale on local markets; rice, vegetables, fruit, livestock, fish. Sarawak as a whole is a net importer of foods, beverages and tobacco;
- (ii) **oil**; both crude and refined products are exported, some refined products are imported;
- (iii) **timber**, which—apart from minor local use—is exported, mainly as logs with a relatively small proportion as processed timber;
- (iv) **rubber** which is exported mainly as ribbed smoked sheet, some sundried sheets and very recently a small proportion as crumb rubber;
- (v) **pepper** which is exported mainly as ungraded black and white dried berries;
- (vi) **construction and building** materials such as cement, pipes and sanitary porcelain are imported;
- (vii) **raw materials for manufacturing.**

TABLE 7.9 SETTLEMENT GROWTH AND TELEPHONE DEMAND

Settlement	Existing Exchange Capacity	1975			1980			1990*		
		Population	Lines per 1,000	Total Lines	Population	Lines per 1,000	Total Lines	Population	Lines per 1,000	Total Lines
Miri/Lutong	2,050	33,000	60	2,000	36,000	80	2,880	55,000	90	4,950
Bintulu (existing area)	300	8,500	45	380	10,000	60	600	16,000	90	1,440
Bintulu (Kidurong area)	none	nil	—	nil	4,000	60	240	22,000	90	1,980
Batu Niah	30	1,500	30	45	2,000	35	70	4,000	40	160
Bekenu	50	800	45	36	1,000	45	45	1,500	40	60
Long Lama	none	800	—	nil	2,500	30	75	7,500	40	300
Beluru	none	700	—	nil	1,000	20	20	1,500	20	30
Labang	none	600	—	nil	800	—	nil	1,000	20	20
Marudi	150	4,400	35	152	5,000	40	200	6,000	40	240
Sebauh	30	800	15	12	900	20	18	1,000	20	20
Niah	20	1,100	15	16	1,300	20	26	1,300	20	26
Kuala Baram	10	800	10	8	1,000	15	15	1,500	20	20
Sub-Total	...	...	...	2,649	...	...	4,189	...	...	9,256
<b>LAMBIR-SUBIS AREA:</b>										
Bukit Peninjau	none	1,500	—	nil	1,800	12	22	2,000	15	30
S.O.P. Village	none	2,500	—	nil	3,500	12	42	3,500	15	53
Mera-3	none	nil	—	nil	1,300	10	13	1,300	15	21
Sungai Tangit	none	1,000	—	nil	1,400	—	14	1,400	15	21
Ladang Tiga	none	500	—	nil	2,500	10	25	4,000	15	60
Subis I	none	500	—	nil	2,500	10	25	2,500	15	38
Subis II	none	nil	—	nil	2,500	10	25	2,500	15	38
<b>NIAH-SUAI RDA:</b>										
Igang	none	nil	—	nil	3,600	35	126	8,000	40	360
Total	...	...	...	2,649	...	...	4,491	...	...	9,876
										plus lines at other new settlements

NOTE: \* The 1990 figures are tentative and provisional.

A wide range of consumption and production goods are imported. This production and consumption pattern is, of course, reflected in the transport activities. In 1970 to 1972 around 90 per cent of the road traffic took place in and around Miri. This will change in the future as the road network expands and lorries take over a large share of the river transport.

#### (b) Future Transport Demand

It has been observed that generally transport demands are growing at a higher rate than the overall economic growth. A growth rate of eight per cent in GRP could therefore lead to annual growth rates for goods transport of eight to ten per cent and for passenger transport of 10 to 12 per cent.

#### (c) Imports-Exports

Estimates of the Study Area's future exports and imports are given in Table 7.10. The figures have been based on information from several sources; statistics covering the past and present situations, on projections of production from developments contained in the Plan and on certain assumptions such as that mentioned in (b) above. The estimates, comprise a lower (I) and higher (II) set of assumptions of general economic activity.

TABLE 7.10 PRESENT AND ESTIMATED FUTURE IMPORTS AND EXPORTS

	<i>Volume in thousand tons</i>			
	1970	I	1990	II
Imports ... ..	103	455		577
Exports:				
agriculture products ... ..	8	456		456
forestry products ... ..	1,014	750 <sup>(1)</sup>		870 <sup>(1)</sup>
other products ... ..	30	120		170
Total: ... ..	1,052	1,326		1,496
Total import and export growth rate/year	1,155	1,781		2,073
		2.2%		3.0%
Total excluding logs growth rate/year ...	159	1,431		1,673
		12.0%		12.5%

(1) These lower figures for 1990 are due to the fact that a much larger part of the forestry products will be processed locally in the future compared to the present export of logs.

#### (d) Modes of Transport

Lorry transport is estimated to grow from 38 mn ton/miles in 1970 to 160-180 mn ton/miles in 1990, which corresponds to a growth rate of eight per cent annually. The number of lorries is expected to double in the same period, from 750 units to 1,500 units but because the average load capacity of future lorry units will be higher than at present the total load capacity will more than double by 1990.

The number of **passenger cars** in the Study Area is expected to increase to between 15,000 and 20,000 by 1990, in 1970 there were approximately only 2,600. Bus transport, measured in number of passenger miles, is estimated to grow by 17 per cent per year and the number of buses to increase from 25 in 1970 to 225 in 1990. The **air transport** is expected to grow as follows:

	Number of Passengers (thousand)		Growth Rate (per cent)
	1970	1990	
Miri ... ..	60	750-1,000	14
Bintulu ... ..	14	300- 500	17

#### 7.4.2 Roads

A total picture of the transport infrastructure is given in Volume I, Chapter 2, Section 2.3.2. Construction of the road network has been phased in the Plan to synchronise with other activities such as agriculture and forestry in the overall development. The planned mileages of roads to be constructed and the estimated costs of construction and improvements up to 1980 are given in Volume I, Chapter 2, while the whole road network planned to 1990 is shown in Figure 7.2. The cost figures given have been based on the standards and estimated costs for main public roads presented in Supporting Report 7, unless the particular item has been already included in the PWD programme, in which case this Department's estimates are used.

About 60 miles of the forest roads in the FAO Units 1, 2 and 3 would also serve planned agricultural development and are proposed to be built as public roads. They would be built to PWD standards at an estimated cost of between \$120,000 and \$150,000 per mile. Normal Class I forest roads cost about \$35,000 per mile. It is assumed in the overall costings for the Regional Plan that the costs of building these public roads would be shared between the Government and the timber firms harvesting the Units.

Particularly high road construction and improvement costs are expected in 1976. This is partly due to about \$6 mn worth of work already planned by PWD for improving and strengthening parts of the Miri-Bintulu road. But by phasing this work over a longer period the high peak costs could be avoided. The urban roads required in the Plan up to 1980 are also given in Volume I, Chapter 2 and the type of road planned for each settlement is described in the Town Development Packages in Annexure II. The main urban roads are planned to be built to PWD standards, but low cost roads are proposed for providing access to residential areas in villages and small towns. The estimated construction costs per mile and standards for these roads are given in Supporting Report 7.

## CHAPTER 8

### HOUSING

#### 8.1 GENERAL

Housing is an important socio-economic element in virtually any society, but particularly in those which are developing. Provision of good housing conditions will be fundamental to the well-being of the greater part of the community in Sarawak and must therefore be a key component of the Development Plan.

Supply of housing, satisfactory in numbers and quality will be important from an economic point of view, since a significant proportion of total development investment will be for this purpose. Furthermore, housing costs as a purchase or rental item will figure prominently in household budgets.

In this Chapter consideration is given to the need for housing, the supply to meet that need and the organisation required to improve supply.

#### 8.2 SARAWAK PROBLEMS

The housing problems in Sarawak and in the Study Area are typical of those of a developing society. The restructuring of agricultural life and the expansion of urban trades create an increased migration and a considerable demand for new housing facilities.

In the towns there will be need for dwellings for new workers attracted to industrial jobs. Also considerable urban renewal will be necessary to avoid the creation of urban slums which could be a consequence of rapid industrial development. In the rural areas the planned agricultural development will require a massive construction of low-cost houses for agricultural workers and smallholder settlers. The problems of providing suitable housing facilities might be more difficult in Sarawak than in many other countries because the Ibans, who will constitute a large proportion of the participants in the new agriculture, are used to houses with considerable space and community facilities. To satisfy these needs will require careful planning and effective construction methods.

#### 8.3 NEED FOR HOUSING

Within the limits of accuracy of the data available estimates have been made of future housing needs in the whole of Sarawak. The calculations have distinguished between different kinds of houses, partly because the demand will vary according to future incomes, partly because a different housing pattern is expected for some rural areas. The forecasts are based on the following assumptions on population growth, household size, settlement pattern and income distribution, and the calculations include a contingency for renewal of the existing mass of houses. The main determining factors assumed are:

- an annual growth rate of population of 2.8 per cent;
- that the ratio between rural and urban populations will change gradually from 75:25 in 1970 to 60:40 in 1990;
- an average household size in urban areas of 5.2 persons;

- an average household size in rural areas of 5.6 persons;
- that there will be a change in the occupancy pattern, reducing the number of households per living quarter from 1.3 to 1.1 in new houses;
- a housing renewal in urban areas of five per cent per year of houses built before 1960;
- a housing renewal in rural areas (calculated in the same way) of two per cent;
- a family income distribution estimated to be as shown in Table 8.1.

Based on these assumptions the future housing demand within the different income groups has been calculated. The results are given in Table 8.2.

**TABLE 8.1 DISTRIBUTION OF FAMILY INCOME**

<i>Income group</i>	<i>1970</i>		<i>Income distribution</i>	
	<i>\$ per year</i>	<i>Average</i>	<i>Urban</i>	<i>Rural</i>
Low	0- 3,500	2,500	50%	90%
Lower middle	3,500- 7,000	5,500	35%	10%
Higher middle	7,000-12,000	9,000	10%	—
High	12,000-and over	20,000	5%	—

<i>Average income</i>	<i>1990</i>	
	<i>Urban</i>	<i>Rural</i>
<i>\$ per year</i>		
4,500	40%	70%
9,500	35%	30%
15,000	20%	—
30,000	5%	—

**TABLE 8.2 ESTIMATED ANNUAL DEMAND FOR HOUSES IN SARAWAK**

<i>Income group</i>	<i>1975-80</i>	<i>1981-85</i>	<i>1986-90</i>	<i>1991-95</i>
	<i>Number of Units</i>			
<i>Urban</i>				
Low	2,200	2,600	2,900	3,500
Lower middle	1,500	1,900	2,500	3,100
Higher middle	500	700	1,200	1,800
High	200	300	400	400
<i>Rural</i>				
Low	4,300	4,200	4,200	4,100
Lower middle	800	1,300	1,600	2,100
<b>Annual Total</b>	<b>9,500</b>	<b>11,000</b>	<b>12,800</b>	<b>15,000</b>

## 8.4 HOUSING IN THE STUDY AREA

In Volume I, Chapter 3 (Table 3.29) the estimated numbers of new houses required in the Study Area during the AP-period are given. It is shown that a total of roughly 8,100 will be required, of these about 3,550 will be in existing towns and villages, about 3,060 in new towns and villages and about 1,500 in road based and private development schemes.

The investment costs of housing, shown in Table 3.30 of Volume I, Chapter 3, have been calculated assuming that the overall ratios of the types of houses will be the same in the Study Area as in the whole of Sarawak. Other assumptions were:

- that most families would be able and willing to pay a maximum of 15 per cent of their income for annual housing costs (the rent/income-relation);
- that the investment costs for such a house will be approximately 10 times the annual cost;
- that the rent/income-relation used in the calculations is based on the estimated family income situation in 1980;
- that the annual expenditure on housing will be borne by the family out of its annual income, which in a long-term perspective is probably the most realistic approach. The result of the calculation is given in Table 8.3.

TABLE 8.3 HOUSE INVESTMENT COSTS COMPATIBLE TO FAMILY INCOME

<i>Family Income Groups</i>	<i>House Price</i>
Low ... ..	\$ 4,500
Lower middle ... ..	\$ 9,500
Higher middle ... ..	\$15,000
High ... ..	\$30,000

If houses of a reasonable standard can be supplied at the above costs a considerable demand for new houses can be foreseen and the present construction capacity would not be sufficient to satisfy it. Therefore, a special effort is required to cater for the expected pressure on the housing market.

## 8.5 THE SUPPLY OF HOUSING

Houses can be built from various materials, in various qualities, at various costs per unit (for instance per square foot of floor space) and by various organisations. These points are dealt with below.

### 8.5.1 Building Materials and Building Costs

Studies were made of the present house building industry, the production prospects and prices of timber, bricks and cement, and of the costs of building houses based on these materials. The conclusions are as follows:

Cement is not produced in Sarawak at present but timber and bricks are. Present practices in house building are characterised by modest efficiency, considerable mark-ups and unreasonable waste of materials. Changes must be made in the construction sector if the numbers and costs of houses given in Table 8.3

are to be met. The supply of imported building materials often passes through several hands, each adding to the cost and still without securing an adequate stock. Material shortages often cause short-term price fluctuations.

Existing traditions in the construction sector also tend to result in the use of uneconomic dimensions. The easy availability of local timber has, for instance, led to the use of excessively large timber, resulting in an increase of cost without adding to the quality of the houses. There does not appear to be any organised attempt to use non-exportable timber species for local construction purposes. To do so would have the dual advantage of lowering local prices and promoting the use of export qualities for export purposes.

The organisation of the construction process appears to vary widely. A general improvement in organisation could raise the productivity of the industry and lower the costs. It appears that the trade at present makes relatively high profits but operates at a relatively low efficiency.

It is believed that Government could contribute to an improvement of this situation, initially through a careful control of the construction of public buildings. By combining analysis and control in this sector, increased competition could be introduced which would increase efficiency throughout the construction industry. It would, however, still be necessary to increase the capacity even of an improved construction industry. The demand for low-cost housing in particular requires an industry that can meet the demand for cheap houses in large quantities. A feasible solution would be the establishment of an industry for prefabricated wooden houses. This would reduce the site installation work to a minimum. Only a large capacity, highly efficient industry could meet the requirements for houses in the Study Area alone. This particular aspect has been the subject of a pre-feasibility study the results of which are given in Supporting Report 8 and is presented as an investible project in Annexure I. It is recommended that a prefabricated housing plant is established as part of the industrialisation of the timber industry.

### 8.5.2 Financing Costs

By financing costs is meant the annual repayment of principal and payment of interest which are necessary to obtain a loan from a bank or a mortgage institution. The total annual amount is called debt service. The calculations shown in Table 8.4 demonstrate the significance of the relationship between repayment period and interest rate for a house which will cost \$4,500 to build.

TABLE 8.4 ANNUAL DEBT SERVICE IN DOLLARS

<i>Repayment period</i>	<i>Interest rate per cent</i>		
	5	8	12
10 years ... ..	585	675	800
25 years ... ..	360	450	600

If the annual house maintenance costs are assumed to be \$85-\$90 the total annual costs will be as follows:

<i>Repayment period</i>	<i>Interest rate per cent</i>		
	5	8	12
10 years ... ..	670	760	890
25 years ... ..	450	540	690

The most expensive solution (10 years/12 per cent) costs nearly double the amount of the cheapest (25 years/5 per cent). If it is assumed that borrowers would pay a maximum of 15 per cent of their income for housing, the necessary annual incomes would have to be:

<i>Repayment period</i>	<i>Necessary annual income in dollars at interest rates of</i>		
	5%	8%	12%
10 years ... ..	4,500	5,100	6,000
25 years ... ..	3,000	3,600	4,600

Only the cheapest type of housing can accommodate a family with an income of \$2,500 to \$3,000 a year, which is the income target for the agriculture schemes and would approximately correspond to a situation in which two members of a family are working and earning \$5 each per day. Accordingly there is ample reason for looking for types of houses which can be built cheaply, and also for maintaining some control over building prices to avoid any unnecessary profiteering at the expense of the lower income groups.

## 8.6 STANDARD OF HOUSES

The standard of housing will depend on an interplay between the demand—i.e. the money purchasers are able and willing to spend on housing—and the supply, including the cost per housing unit. The Consultants were not required in the Scope of Work to formulate a detailed housing programme, but the studies made have led to the conclusion that:

- generally existing houses have a spacious lay-out; this applies to typical Chinese houses as well as to Malay houses and Long houses; most people have grown up under these conditions.
- present building costs are so high, especially after recent significant increases, that settlers who will have to be accommodated in new houses will only be able to afford houses appreciably smaller than those from which many of them come.

There is no single or simple solution to these problems, but the following lines of action are recommended:

- construction of simple houses, of one or two types, each designed in such a way that they can easily be expanded when the occupier can afford it;
- production of prefabricated houses and house components for do-it yourself builders; the use of Sarawak's timber resources offers a particularly good potential in this direction;

- increase facilities for the training of building workers;
- increase the number and capacity of contractors;
- if necessary directly control prices of building materials;
- provide cheap, organised, mortgage-based housing credit; in this connection the proposal for a Sarawak Savings and Development Fund described in Volume I, Chapter 2 is of significance.

## 8.7 HOUSING ORGANISATION

Houses can be built by the occupier himself, his family, friends and village kinsmen. They can be built by contractors for sale or for rent; they can be built by large employers such as SLDB, and they can be built by non-profit housing organisations.

At present two bodies in Sarawak are involved in the development of housing facilities, the Housing and Development Commission (H & DC) and the Borneo Development Corporation (BDC). The former is a quasi-government body, and the latter a joint venture between the Commonwealth Development Corporation (50 per cent), the Sarawak Government (25 per cent) and the Sabah Government (25 per cent). It is the function of H & DC to erect and improve housing in Sarawak, including the development of areas for the housing of both urban and rural populations. The H & DC has the authority and power to carry out necessary investigation, construction and financing, but it has not yet got a sufficient organisation to manage this big task. In fact both the H & DC and the BDC operate almost exclusively through building contractors; they undertake very little actual building themselves.

The BDC has carried out housing schemes both in Kuching and Sibul and it has, with its past experience, a more developed organisation than H & DC. But as BDC operates with private contractors on the same terms as the H & DC, no satisfactory solution to the requirements of efficiency and low-cost has been reached so far. The BDC low-cost housing schemes offer good housing facilities, but nothing which could be classed as low-cost building in the sense defined above. Thus there is a good basis in both of the present housing organisations, but there is some way to go before they can develop cheap and adequate housing.

Therefore, in addition to the housing recommendations already given Government should aim to increase the H & DC organisation so that it can actively enter the building industry. The training schemes proposed for building workers should provide the staff for this. By active participation the H & DC would create new competition in a market which is presently dominated by price-agreements and lack of free competition.

## CHAPTER 9

# ORGANISATION FOR PLANNING AND DEVELOPMENT

### 9.1 INTRODUCTION

In the Scope of Work of this Study the Consultants are required to advise on modifications to the Government's organisational framework which they consider desirable. In addition the Consultants "will recommend suitable institutional arrangements necessary to implement the first six years of the development programme within the context of the longer term Plan. Institutional arrangements will cover the whole field between farmers associations or co-operatives to the general framework within which the Governments must implement the programme and must guide the different groups and sectors in a joint effort of harmonious development.

The Consultants will pay particular attention to the institutional arrangements regarding the transfer to, and settlement on, the area of people of different origin and background."

### 9.2 ALTERNATIVE ORGANISATIONS FOR DEVELOPMENT IMPLEMENTATION

The choice of organisation to implement a Regional Development Plan in which Government is so comprehensively involved is twofold. On the one hand there is an option to build on the existing system of government or quasi government authority, both by expansion within the units which will be involved in implementation and by the creation of new units, mainly for special purposes. On the other hand a Regional Development Authority can be created in order to accept full responsibility for the review of development policy, direction of programmes and even participation in them. Authorities of this type have been created for the future development of Pahang Tenggara, Tenggara Tengal and Johore Tenggara and both are working effectively. Government has already created two special bodies in Sarawak with more limited responsibilities the SLDB and SEDC for implementing development in addition to Government Departments. It was therefore necessary for the Consultants to give careful consideration to the desirability or even necessity for proposing a similar Authority for the Study Area.

It is a sound principle that new bodies should not be created if existing ones are capable of carrying out the necessary tasks within their existing structure or within a somewhat modified and expanded one. If this can be achieved the demands on scarce resources are minimised. This consideration is of particular importance in the case of skilled and experienced manpower which requires years of training and operational work to create. Second, the use of an existing structure avoids expenditure of money on newly created posts, offices, transport, equipment and support personnel, all of which are necessary to new organisations. Third, the possibility is avoided of creating executive bodies with duplicated or overlapping functions which could lead to conflicts of view and responsibility. Fourth, existing organisations which have important functions to perform are not weakened by the withdrawal either of some of their authority or of personnel and supporting services.

It can be argued that an Authority with the massive task of implementing a complex programme over many years must inevitably wield substantial power; that it would also create a second line of direction to State and Divisional Agencies possibly in competition with Ministries and quasi public Boards. Nevertheless the extent to which this is of significance and a possible obstacle to development is largely a matter of communication and personality. Evidence suggests that harmonious relations in such circumstances can be maintained. It can also be argued, probably with some justification, that a single body such as a Development Authority, recognisable in its responsibilities and functions is an organisation with which, say, international lending agencies would prefer to negotiate as a recipient of finances for development.

In Sarawak and in the Study Area at this time, the key issues, on which choice of organisation hinges are; first, whether the requisite structure exists upon which an expanded task force for implementation can be built; second, whether it possesses or can be given the necessary strength and authority to direct and supervise the many agencies for implementation; and third, whether skilled and experienced manpower, particularly at the higher administrative levels, is in short supply and is likely to remain so for some years to come.

The Consultants have carefully examined the problem before recommending which choice of organisation should be made. In their view the existence of the State Planning Unit (SPU), for combining sectoral plans into State Plans and controlling the allocation of funds for development, together with the proposal to create the Implementation and Co-ordination Unit (ICU) specifically to carry out the functions for which it is named, provides the necessary structure and authority within Government to direct and supervise the Regional Development Programme. Evidence also exists regarding shortages, for the time being, of manpower skilled and experienced in administering comprehensive plans.

The Regional Plan proposed contains several elements likely to attract international finance. Some of these, for instance the development of State Land for nucleus estates and associated smallholder schemes and the establishment of a beef industry come within the authority of SLDB and NLC respectively—identifiable bodies to whom loans or credits can be made. Financing of Road Based improvement creates however, a different situation in that negotiations would be undertaken by Government itself, no doubt by the Treasury, the funds ultimately being allocated to the Department of Agriculture via the SPU.

For these reasons the Consultants have concluded that it is desirable to recommend the use of the existing structure of Government, suitably strengthened where necessary and as advocated in the following sections of this Chapter, in preference to the creation of an entirely new Authority with the demands on personnel, services and finance which this implies.

However, it cannot be too strongly emphasised that the essential function in stimulating the planned development will be the co-ordination of the many inputs over time from the various individual agencies. The vital posts concerned with this function are the Administrative Officer (Planning and Development) at the local level and those within the ICU at the State level. The responsibilities of these posts will demand a high degree of competence, strong personality with the ability to achieve co-operation amongst participating agencies, and the full authoritative backing of Government will be required.

FIGURE 9.1 MALAYSIA'S GOVERNMENT ORGANISATION

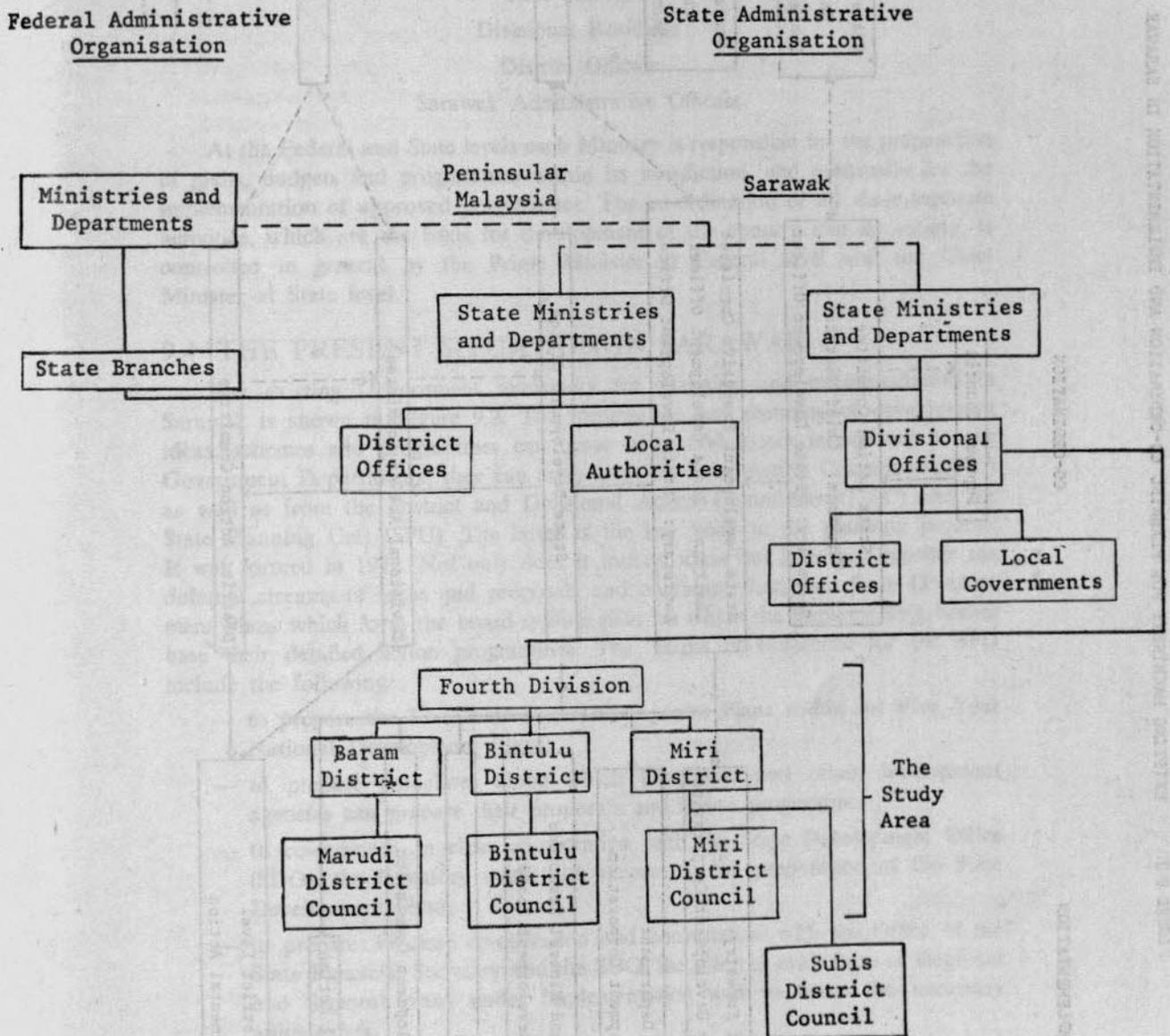
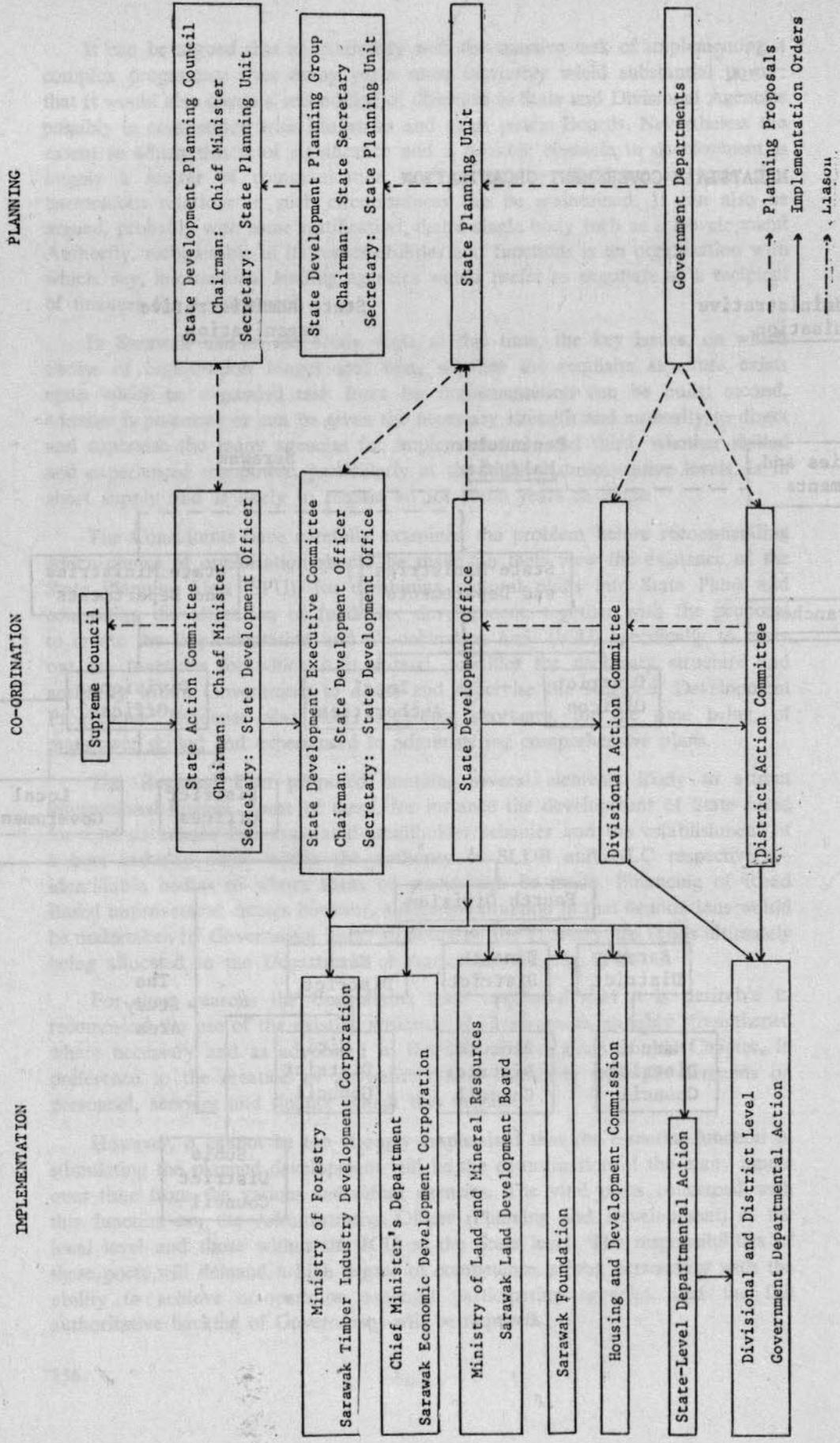


FIGURE 9-2 EXISTING MACHINERY FOR PLANNING CO-ORDINATION AND IMPLEMENTATION IN SARAWAK



### 9.3 SALIENT FEATURES OF THE PRESENT FEDERAL AND STATE SYSTEMS

The administration of public affairs in Sarawak is divided between Federal, State and Local Authorities. The organisation is shown in Figure 9.1 which also traces the linkage to the Study Area.

The chain of command for decentralised administration in Sarawak is as follows:

Chief Minister  
State Secretary  
Divisional Residents  
District Officers  
Sarawak Administrative Officers

At the Federal and State levels each Ministry is responsible for the preparation of plans, budgets and programmes within its jurisdiction, and eventually for the implementation of approved programmes. The co-ordination of all these separate activities, which are the basis for development of the country and its society, is controlled in general by the Prime Minister at Federal level and the Chief Minister at State level.

### 9.4 THE PRESENT SITUATION IN SARAWAK

The existing Government machinery for planning and implementation in Sarawak is shown in Figure 9.2. The formulation and planning of development ideas, schemes and programmes can occur at several places in addition to the Government Departments; they can arise from the State Action Committee (SAC) as well as from the District and Divisional Action Committees (DAC) and the State Planning Unit (SPU). The latter is the key body in the planning process. It was formed in 1972. Not only does it initiate ideas but it brings together the different streams of ideas and proposals and combines them into State Development Plans which form the broad outline plan on which the implementing bodies base their detailed action programmes. The Terms of Reference for the SPU include the following:

- to prepare the Five Year State Development Plans within the Five Year National Development Plans;
- to prepare guidelines along which Divisional and other development agencies can prepare their proposals and action programmes;
- to co-ordinate, in close co-operation with the State Development Office (SDO), the inventory work with respect to the preparation of the State Development Plans;
- to prepare, in close co-operation and consultation with the Office of the State Financial Secretary and the SDO, the internal evaluation of Regional and Sectoral plans under implementation and to make the necessary adjustments.

Thus there is a combination of the Departmental and Divisional plans into one whole for the State. Also the capital budgeting is co-ordinated by SPU and there is provision for adjustment of plans in the State Development Planning Group and State Development Planning Council where the various Ministries can

obtain alterations if these deemed necessary. At present, when the State plans have been finally agreed to by the SAC and the Supreme Council and passed by the Federal Authorities, the orders for implementation are issued to the various agencies by the State Development Executive Committee and the SDO.

Basically all these arrangements are good and form a sound foundation on which to build a strong central planning and implementation control organisation. But operation of the present system has shown certain weaknesses. The orders issued by SDO contain only guidelines along which the implementing agencies must prepare their action programmes. The implementing bodies are under different Ministries and some are independent Statutory Bodies, and, although co-ordination has been provided for through the SDO, which is charged also with the task of ensuring that there is compliance with the agreed plans, these arrangements have not proved to be entirely satisfactory. For example, the orders for agricultural development in the Study Area travel to three main agencies; the SLDB via the Ministry of Lands and Mineral Resources, the Department of Agriculture via the Ministry of Agriculture and the Department of Public Works via the Ministry of Communications and Works. Within these agencies there are sections for carrying out detailed planning but there is no provision for co-operation between them in this planning.

Co-ordination of implementation is in practice obtained through the DAC's and the Divisional Development Executive Committees. In the Fourth Division these committees are chaired by the Resident and the members of both of them are practically the same. The members of the DAC, for example, include all Divisional Heads of Departments, all the District Administrative Officers as well as the local senior representatives of SLDB, SEDC, MARA and Military Commander. The secretary of both committees is the Administrative Officer Planning and Development (AO (P&D)). This arrangement is good and places the AO(P&D) in a strong position for combining the detailed plans from the various Departments and institutions into a Divisional implementation programme, and the committees are ideal for arranging co-ordination and co-operation between the implementing agencies. However, the Resident of the Division, as chairman of the DAC, has direct authority only over the Administrative Officers. Co-ordination and co-operation from other Departments and institutions can be requested but not demanded. If there happens to be a divergence of detailed plans or an unco-ordinated timing of inputs these can only be overcome on an officer-to-officer approach.

So far integrated development in Sarawak has been on a relatively small and simple scale and therefore this personal approach has worked reasonably well. But in the future when more complicated and integrated plans are being implemented, such as those now proposed for the Study Area, the co-ordination of inputs by each implementing agency and strict compliance with the plans must both be assured.

Government recognises the present weakness in the organisation and during preparation for the Mid-Term-Review of the Second Malaysia Plan 1971 to 1975, the Sarawak Government recommended that a State Economic Council and a State Development Planning Committee should be established along the lines of the National Economic Council and National Development Planning Committee. The new bodies would take over the functions of the State Action Committee

and the State Development Executive Committee, which are now serviced by the SDO. The SDO, which the Government suggests would in future be more appropriately called the Implementation and Co-ordination Unit (ICU), would then be freed to play more effectively its proper role as the co-ordinating body for the implementation of development.

Government has also stressed the need to strengthen the SPU by attaching to it an Estimates Sub-committee and a Standards and Costs Sub-committee, again along the pattern of the Federal system. The new machinery for planning, co-ordination and implementation proposed by Government is shown in Figure 9.3.

## 9.5 FUTURE PLANNING AND IMPLEMENTATION

The proposed changes described above will help considerably towards ensuring compliance by implementing agencies with the agreed plans, and will strengthen SPU to fit it for its future enhanced role. It is suggested, however, that the new machinery would be made more effective by a slight change in the chain of command to the ICU which should not be seen as part of, or sub-ordinate to, the SPU; though the two must be closely linked. There must also be direct contact between the ICU and the Ministries and the headquarters of the Departments and Statutory Bodies. The ICU must consist of highly competent officers with sufficient authority to deal directly with Ministers and Heads of Departments. The Head of the ICU must be highly ranked and work closely with the office of the Chief Minister. Also, once a regional development plan has been agreed to by the Government, all orders for implementation work associated with that plan should pass through the ICU.

It is recommended that one particular officer in the ICU be made responsible for the co-ordinated implementation of the Miri-Bintulu Regional Plan. Similarly when other regional plans are formulated other officers would be given special responsibility for them.

In addition, in order to enable the DAC to perform more effectively, its co-ordinating role at Divisional level, it is recommended that the AO (P&D) be made a member of the staff of the ICU. In this way unimpeded access will be available from the DAC to the highest State executive authority directly involved with co-ordination of development. Assistance could thus be quickly obtained in solving problems arising out of lack of co-ordination between implementing agencies at the Divisional level; problems which, for example, the DAC has insufficient authority to resolve. This proposed organisation is shown in Figure 9.4.

At the Divisional level it is recommended that the AO (P&D) be given the assistance of two new officers; a Rural Development Officer and an Urban Development Officer. These staff, each in their own discipline, would assist in compiling detailed Divisional implementation programmes and would provide the close liaison contact between the DAC and the implementing agencies— in the case of agriculture in the Study Area, the SLDB and the ADU. This chain of command and the co-ordinating function of the DAC is shown in Figure 9.5.

The co-ordination of inputs by other implementing bodies such as the Sarawak Economic Development Corporation (SEDC) and the Public Works Department (PWD) would be obtained through similar chains of command

FIGURE 9.3 SARAWAK GOVERNMENT'S PROPOSED ADMINISTRATIVE MACHINERY FOR PLANNING AND IMPLEMENTATION

PLANNING

IMPLEMENTATION

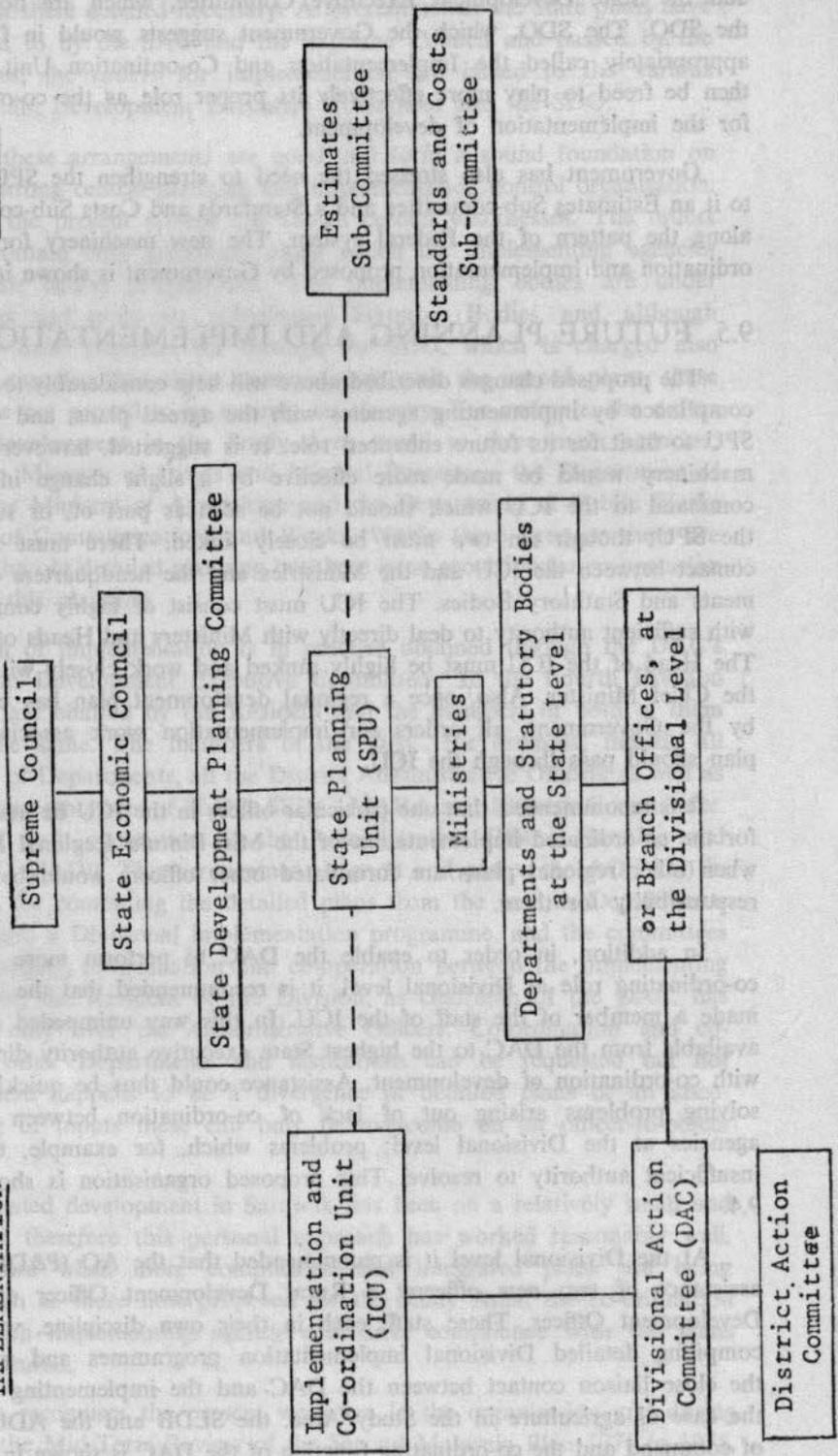
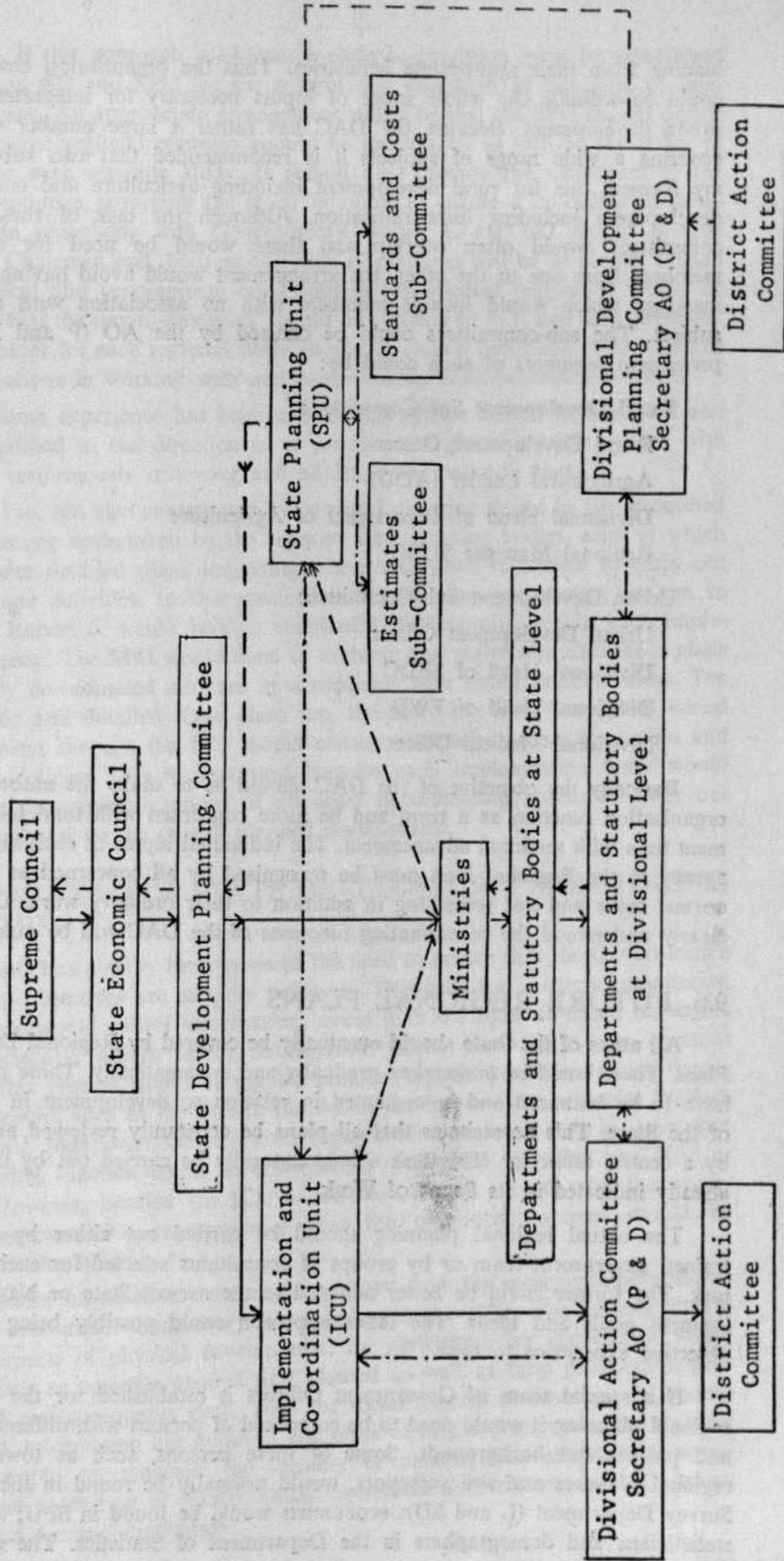


FIGURE 9.4 PROPOSED FUTURE ADMINISTRATIVE MACHINERY FOR PLANNING AND IMPLEMENTATION

IMPLEMENTATION

PLANNING



Legend:

- - - -> Planning Proposals
- > Implementation Orders
- - - -> Liaison

leading from their appropriate Ministries. Thus the organisation envisaged here could co-ordinate the whole range of inputs necessary for integrated rural and urban development. Because the DAC has rather a large number of members covering a wide range of subjects it is recommended that two sub-committees are formed, one for rural development including agriculture and one for urban development including industrialisation. Although the task of these two sub-committees would often overlap and there would be need for co-operating members from one to the other, the arrangement would avoid having to call full meetings which would include members with no association with a particular subject. The sub-committees could be chaired by the AO (P and D) and the permanent members of each could be:

**Rural Development Sub-Committee:**

Rural Development Officer

Agricultural Leader (ADU)

Divisional Head of Department of Agriculture

Regional Manager SLDB

**Urban Development Sub-Committee:**

Urban Development Officer

Divisional Head of SEDC

Divisional Head of PWD

Divisional Medical Officer

Basically the objective of the DAC should be to make the entire Divisional organisation function as a team and be more concerned with total local achievement than with sectional advancement. The individual inputs of each implementing agency to the Regional Plan must be recognised by all concerned as being their normal tasks and not something in addition to their ordinary work. Once this is clearly understood the co-ordinating functions of the DAC will be made easier.

## 9.6 FUTURE REGIONAL PLANS

All areas of the State should eventually be covered by Regional Development Plans. These could be undertaken gradually and systematically. These plans would have to be balanced and co-ordinated in relation to development in other parts of the State. This necessitates that all plans be constantly reviewed and adjusted by a central authority. This task should naturally be carried out by the SPU, as already indicated in its Scope of Work.

The actual regional planning should be carried out either by a specially trained government team or by groups of consultants selected for each particular task. The former could be better adjusted to the overall State or National development goals and ideas. The latter approach could possibly bring wider and objective experience to bear.

If a special team of Government Officers is established for the purpose of regional planning it would need to be composed of persons with different technical and professional backgrounds. Some of these persons, such as town planners, regional planners and soil surveyors, would normally be found in the Land and Survey Department (L and SD); economists would be found in SPU; and general statisticians and demographers in the Department of Statistics. The Consultants

believe that, if this approach is chosen, a close co-operation must be established between L and SD and SPU for the control and execution of this type of integrated planning. An appropriate arrangement would be that the SPU should decide where and when regional planning should be undertaken as well as the terms of reference for each separate study. It should also provide the Chairman of the Steering Committee governing the study in order to ensure a co-ordinated development plan complying with Government's wishes. L and SD should provide the Deputy Chairman and, because this type of planning will be so closely related to the physical and geographical conditions of the selected regions, it would be appropriate that the day-to-day work should be carried out in L and SD's premises. The team leader for each regional study should be chosen according to experiences and qualifications in working with and co-ordinating multi-professional teams.

After some experience has been gained, this system should be reviewed and possibly modified in the direction of a permanent regional planning office with the task of continuously reviewing and adjusting the regional plans.

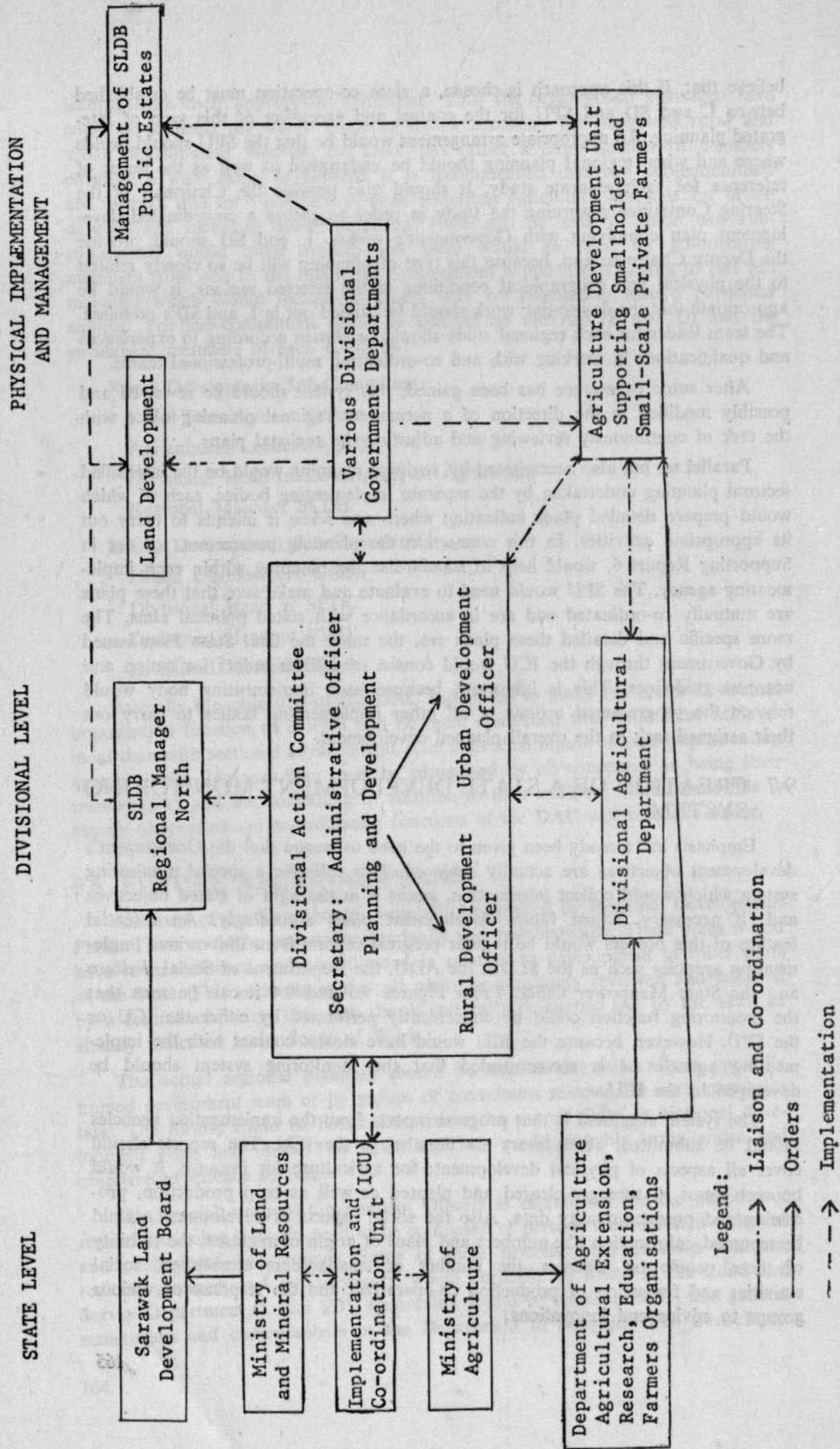
Parallel to, but also necessitated by, regional planning would be the intensified sectoral planning undertaken by the separate implementing bodies, each of which would prepare detailed plans indicating where and when it intends to carry out its appropriate activities. In this connection the planning parameters, set out in Supporting Report 6, would help to standardise the planning within each implementing agency. The SPU would need to evaluate and make sure that these plans are mutually co-ordinated and are in accordance with stated political aims. The more specific and detailed these plans are, the more the final State Plan issued by Government through the ICU would consist of definite orders for action and not just guidelines. This is important because each implementing body would rely on the programmed actions of all other implementing bodies to carry out their assigned task in the overall planned development.

## 9.7 CREATION OF A STATE DEVELOPMENT MONITORING SYSTEM

Emphasis has already been given to the need to ensure that the Government's development objectives are actually achieved. This calls for a special monitoring system which would collect information, assess it in the light of stated objectives and, if necessary, adjust future development plans accordingly. An essential feature of this process would be regular progress reports from the various implementing agencies such as the SLDB, the ADU, the Department of Social Welfare and the State Manpower Office. From Figures 9.3 and 9.4 it can be seen that the monitoring function could be conveniently performed by either the ICU or the SPU. However, because the ICU would have closest contact with the implementing agencies it is recommended that the monitoring system should be developed in the ICU.

The system suggested is that progress reports from the implementing agencies should be submitted, about every six months, to the ICU. The reports should cover all aspects of physical development; for agriculture for instance, it would be such items as acreages cleared and planted as well as crop production, processing and produce quality data. Also the social aspects of development should be recorded, information like numbers and place of origin of migrants, the stability of these people on schemes, the number of smallholders established, social activities and formation of production co-operatives and the response of various groups to advice and innovations.

FIGURE 9.5 ORGANISATION FOR IMPLEMENTING INTEGRATED DEVELOPMENT (AGRICULTURE TAKEN AS AN EXAMPLE)



The reports should be based on material collected by the staff working locally in the various implementing agencies, but the collation and final presentation should be the responsibility of the headquarters of each agency. The responsibility of the ICU would be to analyse the reports and identify successes or failures. Then, in consultation with the SPU, final recommendations should be made to Government for adjustments in ongoing development schemes and changes in the plans for future schemes. This monitoring function of the ICU and SPU is presented diagrammatically in Figure 9.6.

In summary the proposed development process could be described in the following way:

The Ministries and Departments would remain the basic units in both planning and implementation. Their proposals would be based on their thorough knowledge and understanding of their specific fields of responsibility, and on increasingly specific guidelines issued by the Government through the SPU. Thus political aims of the Government would be transformed into practical plans and programmes. Regional Plans would be tools in this process, but they would always be transformed into Sectoral Programmes and Budgets (estimates) in order to obtain legal power.

SPU would evaluate the proposals from individual Departments and agencies. Then in co-operation with these bodies would combine their proposals into State Plans leading to final action programmes and budgets.

ICU would follow, co-ordinate and control the implementation of the action programmes and would be supported at the local level by the DAC's. The ICU would also have a monitoring function in observing and evaluating the development resulting from the implementation of the programmes. Then in conjunction with SPU suggestions would be put to Government for any necessary adjustments needed in the ongoing programmes as well as in the planning goals and guidelines for the next planning period.

Implementation would be carried out by the existing appropriate agencies and Departments as part of their normal work.

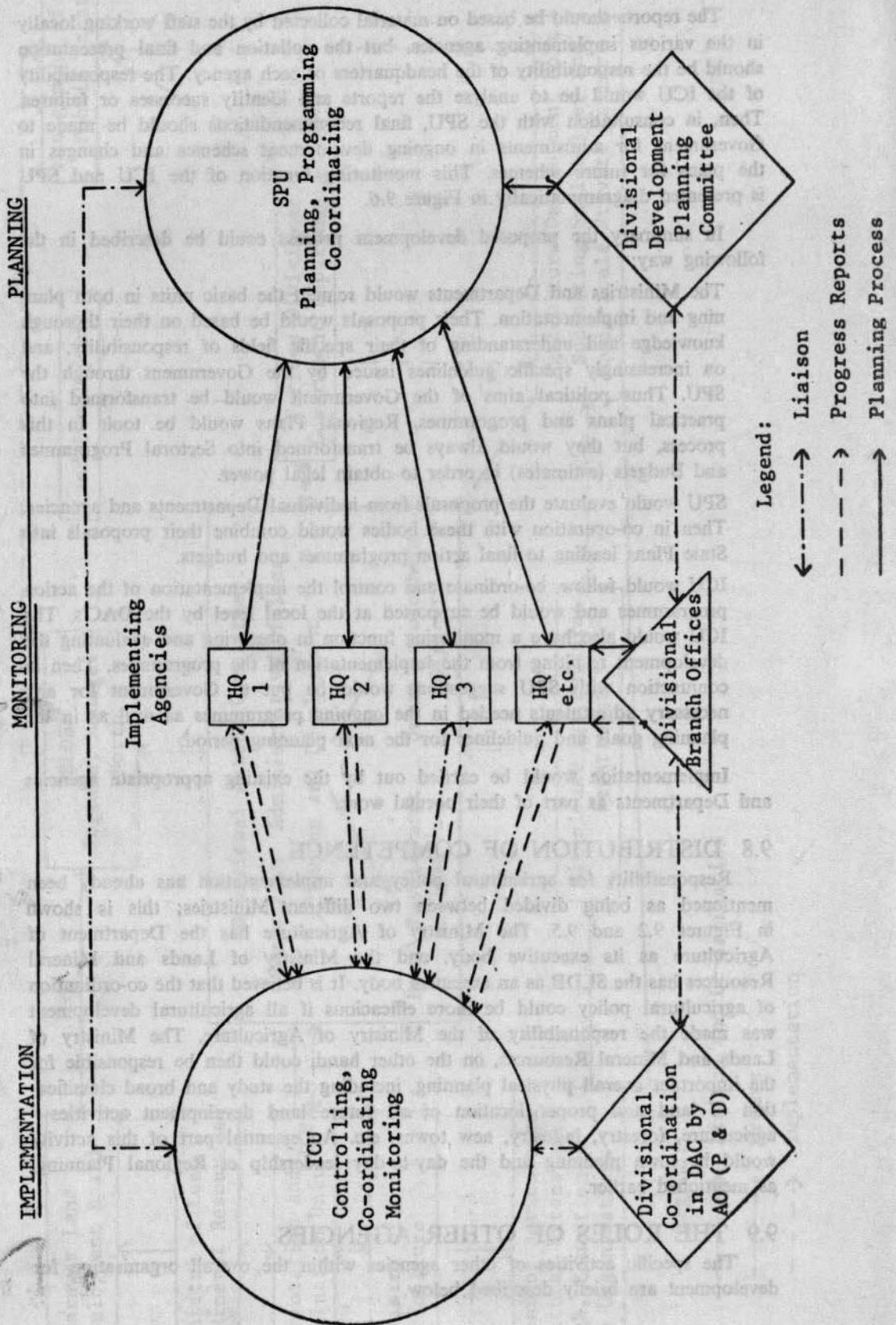
## 9.8 DISTRIBUTION OF COMPETENCE

Responsibility for agricultural policy and implementation has already been mentioned as being divided between two different Ministries; this is shown in Figures 9.2 and 9.5. The Ministry of Agriculture has the Department of Agriculture as its executive body, and the Ministry of Lands and Mineral Resources has the SLDB as an executive body. It is believed that the co-ordination of agricultural policy could be more efficacious if all agricultural development was made the responsibility of the Ministry of Agriculture. The Ministry of Lands and Mineral Resources, on the other hand, could then be responsible for the important overall physical planning, including the study and broad classification of land and proper location of all future land development activities—agriculture, forestry, industry, new towns, etc. An essential part of this activity would be town planning and the day-to-day leadership of Regional Planning, as mentioned earlier.

## 9.9 THE ROLES OF OTHER AGENCIES

The specific activities of other agencies within the overall organisation for development are briefly described below.

FIGURE 9-6 PLANNING, IMPLEMENTATION, MONITORING



### 9.9.1 The State Manpower Section

The deficiencies of the present system of recruitment for land development schemes have been mentioned in Chapter 2. The Government is aware of the position and has recently created a Manpower Section in Kuching within the Federal Department of Labour. The Section is headed by an Assistant Director of Labour and the Terms of Reference for the section appear to orientate it well for the task it has to perform. But in view of the importance of creating a sound labour recruitment organisation in Sarawak, Government must ensure that the new Section is made sufficiently large to be able to undertake the following responsibilities:

- (a) to provide a State-wide labour exchange and registry for all types of labour—skilled and unskilled—and all types of employment such as service trades, manufacturing and agriculture;
- (b) to identify, through a Research and Planning Team, consisting of a Sociologist and two or three sociologically trained assistants, future labour needs and areas of current unemployment or under-employment; and
- (c) to provide Welfare Officers (with training in sociology) for each major scheme to advise on and organise arrangements for assisting participants on the development schemes to adjust themselves to their new surroundings.

The main task of the Section should be to establish a State-wide network of Labour Registry Offices where potential workers can be matched with available jobs. The functions of screening and selection would remain with the receiving employer or agency. The Ministry of Labour would continue its present role of ensuring compliance with labour legislation including that which applies to workers and supervisory staff employed on agricultural estates.

### 9.9.2 The Sarawak Economic Development Corporation (SEDC)

The vital role of this Corporation in the promotion of industries is described in Chapter 5. The SEDC's activities, like those of all other agencies, would be integrated and co-ordinated into the overall development through the ICU and District Action Committees.

### 9.9.3 The Sarawak Land Development Board (SLDB)

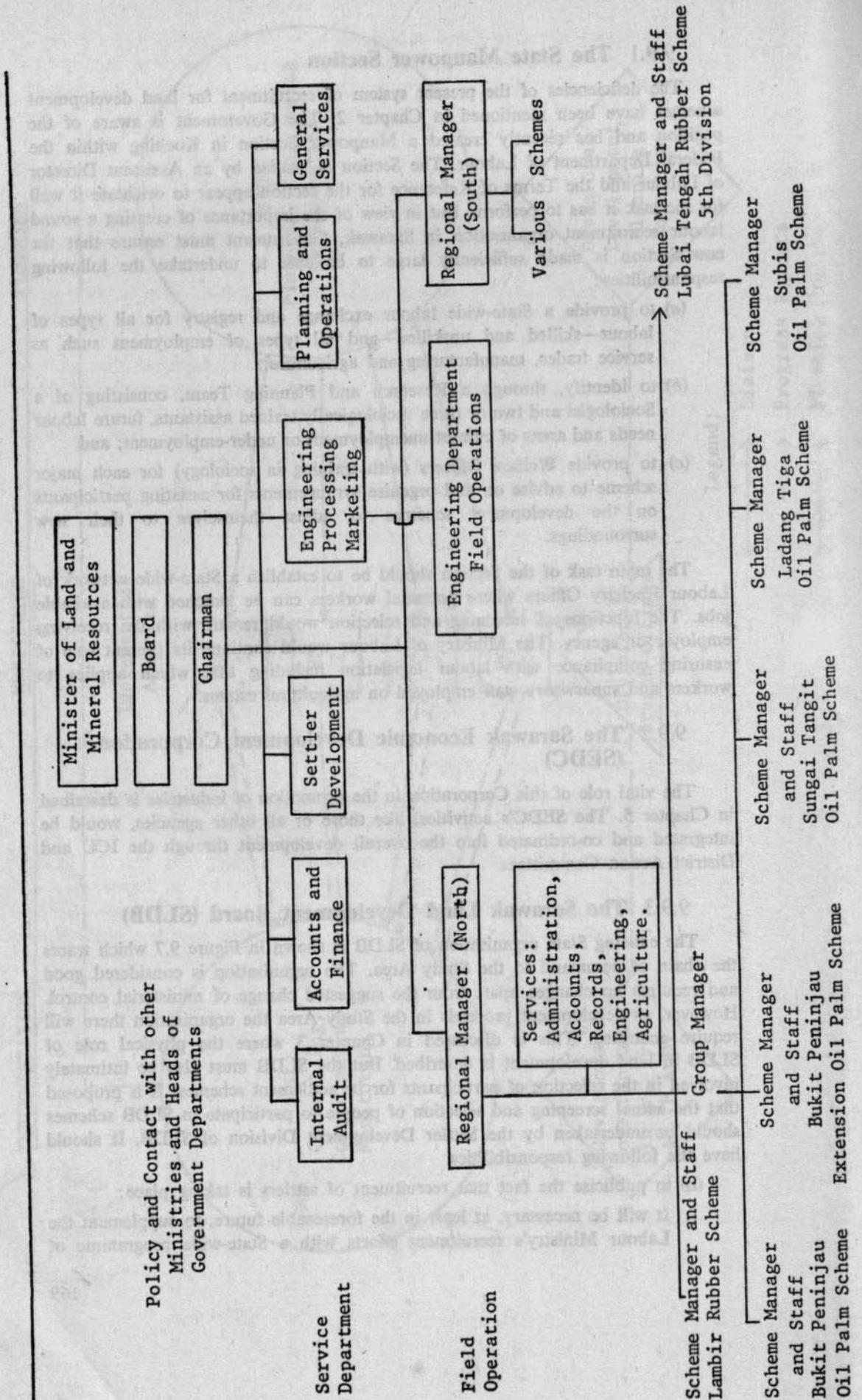
The existing State organisation of SLDB is shown in Figure 9.7 which traces the chain of command to the Study Area. The organisation is considered good and requires no changes apart from the suggested change of ministerial control. However, as development proceeds in the Study Area the organisation there will require enlarging. This is discussed in Chapter 3 where the physical role of SLDB in land development is described. But the SLDB must also be intimately involved in the selection of participants for its settlement schemes. It is proposed that the actual screening and selection of people to participate in SLDB schemes should be undertaken by the Settler Development Division of SLDB. It should have the following responsibilities.

- (a) to publicise the fact that recruitment of settlers is taking place:

It will be necessary, at least in the foreseeable future, to supplement the Labour Ministry's recruitment efforts with a State-wide programme of

FIGURE 9-7

PRESENT ORGANISATION OF THE SARAWAK LAND DEVELOPMENT BOARD



publicity and information. Included in this programme should be scheduled visits, screening and information sessions by Settler Development Officers with potential recruits at Labour Registry Offices throughout the State. Here the Research Team of the Manpower Section can assist by identifying areas within the State where qualified recruits are most likely to be found. In addition, visits to development areas should be arranged for village leaders, headmen and others who exert an influence on local public opinion.

- (b) to formulate and review selection criteria by means of questionnaires, interviews, selection boards and other screening procedures to ensure the selection of a suitable settler population:

Publicity programmes can only create initial interest and must be followed up with systematic screening of candidates according to appropriate criteria of suitability. These criteria and the procedures to be used in selecting settlers are discussed in the sub-section below.

- (c) to ensure that recruits are fully aware of the conditions under which they are recruited and the positions for which they are selected:

This is a critical task and must be done properly if candidates are to make an informed choice as to whether to join a scheme or remain where they are. This necessitates the organisation of thorough information sessions for selected candidates with settler development officers. Great assistance in this aspect could be given by film shows of conditions on actual schemes and, as already mentioned, by visits by Community Leaders. It is important that doubts and long-term prospects, as well as the overall objectives of the scheme, should be discussed realistically with prospective participants. It is desirable in this connection, that settler development officers have some detailed knowledge of the sociology of the groups they are dealing with, and that, in addition to the schemes, selected candidates be shown training and ADU Centres and be allowed to gain a personal impression of the total development organisation in which they will participate. It is also important that the time between selection and entry into the scheme be kept as short as possible.

- (d) to arrange for orderly transport and physical settling in of participants:

These arrangements should include transportation of the participant, his family and belongings from his original home to the settlement scheme. Of particular importance would be the reception at the scheme, the new arrivals must be given the feeling that they are expected and welcomed. Immediate accommodation should be available.

The selection of people to become smallholder farmers must be done through a simple and well-publicised procedure. The criteria for eligibility, which should be as objective as possible, should be fully understood by all participants prior to entry into the scheme. It is suggested that the main, but not only, channel for selection of smallholder farmers on State Land should be from within the labour/settler force of SLDB. The minimum qualification for such candidates should be satisfactory completion of a term of service as a labourer with SLDB, and, in effect, the potential smallholder should select himself by his performance. The final selection for smallholder status is certain to be regarded as a

matter of utmost concern by most participants because it directly relates to their basic motives for entering the scheme; namely security, independence and property ownership. Therefore it is important that the Settler Development Division in SLDB should make every effort to select potentially suitable candidates from the outset.

The other main source of smallholders should be people who have undergone a course at the Farmer Training Institutes.

At present young people completing their courses are expected to either return to their homes to farm or to join Youth Settlement Schemes. However, it is recommended that youths so trained and wishing to join a scheme should be given priority selection for smallholder status on the SLDB developed schemes. This recommendation follows a sociological study of an ongoing Youth Settlement Scheme near Miri. An account of the study is given in Supporting Report 4.

There should be an appeal procedure by which selection decisions and assignment of farming land can be reviewed. Possibly the welfare officer could act as the final arbiter.

#### 9.9.4 Selection Policy

The aim of the selection policy should be to ensure that those people who wish to work in agriculture either as labourers or smallholders are found and given the opportunity to do so. Present selection policy aims at choosing persons who are rural, landless or near landless and/or subsistence farmers who have little access to modern amenities. Candidates for SLDB schemes are screened by a selection board and score points according to age, family size, current economic circumstances, skills, physical fitness and prior farming experience. The scale of points have been fixed to suit present recruitment policies but the scale can be adjusted at any time to reflect changing priorities or, experience. In Sarawak, for example, less importance is assigned to non-farming skills and more to landlessness, family size and previous farming background than in the FELDA point system used in Peninsular Malaysia. It is recommended that the present point evaluation system be continued but it should be periodically reviewed to ensure that it adequately defines the people's desires. A second recommendation is that provision be made for block recruitment of groups of people who wish to settle as a group or as an entire longhouse or village-community.

## APPENDIX I

### SCHEDULE 'A'

#### SCOPE OF WORK

##### PART I: INTRODUCTION

###### (a) General Strategy

1. It is the intention of the Government to develop the region on similar terms to the Johor and Pahang Tenggara Region of West Malaysia, modified as necessary to suit the socio-economic conditions of Sarawak and the physical conditions of the region itself.

2. Assuming that the necessary studies commence early in 1972 and are completed in 1974, major development could start in 1975, the last year of the Second Malaysia Plan, and continue throughout the Third Malaysia Plan.

3. Agricultural development will be the central thrust theme of the development programme, but non-agricultural opportunities are to be encouraged and employment feasibility will be maintained through settlement patterns and arrangements with settlers and contract labourers. Once areas suitable for permanent agriculture have been cleared, land will be made available to settlers, the majority of whom are expected to come from the States of Peninsular Malaysia at the same time, recognising the economic aspects of peasant farm communities in the region. Rubber and oil palm will probably be the main crops in the areas to be developed, possibilities for crop diversification must be explored and exploited.

4. Timber production will be the second major activity, based on permanent forest reserves and timber cleared from land scheduled for future agricultural development. Evaluation of timber and agricultural production should be done while the region is being developed, to form the basis of a future manufacturing industry. The development of other industries must follow wherever opportunities appear naturally. The availability of gas in the area could be an important factor in this regard, as widespread development of a modern service sector must emanate from the basic development programme in the primary sector in order to establish viable communities.

5. In any planning must assure that new townships and villages are attractive places to live in, and are supplied with minimum amenities including clean water and electricity, adequate health and educational services. Transport planning will raise, progressively and progressively, standards and development throughout the State and will be the systematic development of feeder roads and the construction of national trunk facilities. In regard to the latter it will be necessary to improve highway standards and to explore possible locations of one or more adequate crossroads to meet the minimum standards, not less than 100 ft wide. The possibility of developing a new, or higher standards, township in the future should also be explored carefully.

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2. Assuming that the necessary studies commence early in 1972 and are completed in 1974, major development could start in 1975, the last year of the Second Malaysia Plan, and continue throughout the Third Malaysia Plan.

3. Agricultural development will be the central initial theme of the development programme, but non-agricultural opportunities are to be encouraged and employment flexibility will be maintained through settlement patterns and arrangements with settlers and contract labourers. Once areas suitable for permanent agriculture have been selected, land will be developed to accommodate settlers, the majority of whom are expected to come from the First, Second and Third Divisions, at the same time safeguarding the legitimate interests of present farm communities in the region. Whereas rubber and oil palm will probably be the main crops in the areas to be developed, possibilities for crop diversification must be explored, and exploited fully.

4. Forest exploitation will be the second major activity, based on permanent forest reserves and timber cleared from land scheduled for future agricultural development. Processing of timber and agricultural products should be done within the region as much as possible, to form the basis of a future manufacturing industry. The establishment of other industries must follow whenever opportunities appear attractive. The availability of gas in the area could be an important factor in this respect. A planned development of a modern service sector must complement the basic development programme in the primary sector in order to establish viable communities.

5. Proper planning must assure that new townships and villages are attractive places to live in, and are supplied with modern amenities including clean water and electricity and adequate health and educational services. Transport planning will assure consistency with transportation needs and development throughout the state and will cover the systematic development of feeder roads and the construction of adequate port facilities. In regard to the latter, it will be necessary to improve lighterage facilities and to explore possible locations of one or more adequate coastal ports which can accommodate vessels and barges up to possibly 1,000 DWT. The possibility of developing a port of higher standards sometime in the future should also be explored carefully.

6. New settlers in the area will come from various racial communities and from different geographical areas. Settlement patterns will have to be flexible to accommodate the different groups of settlers and to assure that each group of settlers and each individual will make a positive contribution to a balanced and integrated development of the new areas.

### **(b) Areas of Emphasis**

7. In line with the major emphasis on agriculture and forestry, at least initially, a first requirement is to develop a broad land use classification of the whole area: demarcating areas to be reserved for modern agriculture, traditional agriculture, permanent forest exploitation, conservation, mining and urban settlement. These delineations will be consistent with and will enhance the comprehensive long term development of the region. Also, size of individual holdings will need to change over time and this together with means for accommodating a flexible work force in the project area will be taken into account.

8. Basic information with respect to forestry for part of the area is already collected by a UNDP/FAO team and restricted plans for forest industry development will be prepared independently by this same team and covering the limited area. Most of the region is covered already by a reconnaissance soil survey, and the unsurveyed areas will be similarly covered by the Department of Agriculture before the regional study commences.

9. Once broad zonation and perspective plans have been prepared, a semi-detailed Master Plan sufficient for 20 years requirements must be prepared for the settlement of about a quarter of a million acres, to be supplemented by detailed project plans for shorter term sectoral activities in the form of investible packages for about 50,000 acres to be developed mainly during the Third Malaysia Plan. Much attention will have to be given to the selection of suitable crops aiming at a maximum diversification within the limits imposed by soils, climate and future markets.

10. Local processing of agricultural and forest products must be maximised and based on examination of present trade patterns, labour availabilities and manufacturing potentials, possibilities for introducing manufacturing, services and other economic activities must be fully explored, and some attention must be given to the possibility of introducing other industries not directly related to agriculture and forestry.

11. Soil surveying at various levels will be necessary within the Master Plan and agricultural project plans areas, and the soil mapping programme must be supplemented by terrain analysis, particularly for those areas where the amplitude of relief is low and the ground slope relatively high, giving rise to complex patterns of micro-relief which are very difficult, if not impossible, to distinguish from published maps or aerial photographs.

12. Transport planning will be required on all aspects of air, land and water communications for agricultural, forestry and industrial products. Townships and villages must be provided with an adequate supply of water and electricity and health and education facilities.

13. Settlers will come mainly from the First, Second and Third Divisions and belong to different racial communities with contrasting social and cultural backgrounds, occupational patterns and ways of life. Sociological studies related to

problems of settlement have already been undertaken. The Government, through its counterpart staff, will provide data for the relevant population groups indicating age distribution by ethnic groups and geographical location. From the information provided by the counterpart staff of the Government and the above studies the consultants should ascertain which groups and individuals are likely candidates for settlement, how migration can be made attractive to various groups and individuals and under which conditions they should be settled. Settlement patterns may have to be quite flexible, encompassing settlements with emphasis on individuals through various forms of co-operative settlements, community settlements and possibly public or private estates employing wage labourers.

14. Finally, the study will have to cover such aspects as overall phasing, financing, organisation and management, and *training of specialists* required in the area during the development period.

15. As previously indicated, the study will take about two years, subdivided into two district phases of about one year each.

## PART II: DETAILED GUIDELINES

### (a) Phase I

16. This phase of the study has several interrelated objectives. The consultants will prepare in the first phase a *zonation plan*, containing broad land use zoning proposals. The consultants will further prepare a long term *perspective plan*, containing in broad outline socio-economic development proposals for the region as a whole, over a 20 year period.

17. The consultants will locate about a quarter of a million acres most suitable for the development of settled agriculture and select about 50,000 acres in one or a few blocks for immediate development. These areas will be the subject of more detailed planning during Phase II of the study. Finally, the consultants will during Phase I collect information and study particular problems of development as a preparation for more detailed planning in Phase II. A particular problem of development to be studied in detail during Phase I is the social problem related to settlement and migration.

### Zonation Plan

18. This plan, which will include proposals for broad zonation of the region in future land use terms, will be based mainly on an analysis of all the available relevant physical and economic resource data, and will require a familiarisation by the Consultants staff with the present physical, economic and social conditions in the region, possible future land use needs and basic land resource capabilities. No substantial programmes of field survey should be necessary during this phase, except in so far as these might assist the completion of Phase II. This is because reconnaissance soil survey data will be available for the whole area and a forest inventory for part of the area has been completed which if supplemented will provide sufficient information for general planning purposes, while geological indication suggests that there are minimal mining potentials. A recently completed 1:50,000 topographic map cover and a total aerial photographic cover provide a wealth of detail which will afford an excellent opportunity for desk study sufficient to meet the needs of the zonation plan.

## Perspective Plan

19. Based on 20 year projected development of the main sectoral activities primarily agriculture and forestry, and processing industries directly related to these activities, but including other economic activities as well, the consultants will, in broad outline, project the structure of a balanced economy and society, including in general, commerce and other tertiary activities and services. The projections, will, in order of magnitude, indicate the contribution to national income by sector and include estimates of the population in the area, by occupation and level of skill, as is consistent with the broad economic projections.

20. The consultants will discuss policies required to support a development as projected over a 20 year period with particular attention to:

(1) **Manpower:** The consultants will compare the requirements for particular skills in broad groups and levels, indicated by the projected occupational structure with the characteristics of the likely settler population. The consultants will estimate, in the light of this comparison, requirements for general and *specialised* education and training within the Development Region and in *Sarawak as a whole*, and the possible need to supplement temporarily skills not sufficiently available in Sarawak by imported skills. The consultants will detail the labour requirements in different activities at different periods of the development plan and will provide for the necessary movement of labour resources among locations and activities so as to reduce possibilities of serious unemployment or underemployment in the project area.

(2) **Financing:** The consultants will, in order of magnitude, estimate the overall financing requirements over the 20 year period, the generation of funds to be supplied from outside the area by official and private sources and relate these requirements to global macro-economic projections of the supply of funds in Sarawak and Malaysia over the same period.

(3) **Exports and Imports:** The consultants will estimate, in orders of magnitude, export proceeds, import requirements and import savings consistent with the overall structure of the economy as projected.

(4) **Settlement Pattern and Infrastructural Requirements:** The consultants will, in broad outline, suggest a settlement pattern, covering urban, semi-urban and rural settlements, as is consistent with the overall structure of the economy. The consultants will discuss the demand for and possible sources of supply of power, water and sewage systems and the need for educational, health and other public facilities and will prepare a phased investment plan for these facilities.

(5) **Transport:** The consultants will project future air, land and water transport requirements, internal and external, consistent with overall development. The consultants will prepare a schedule of phased additions and improvements to the existing facilities based on present and expected costs of investment and operation. The consultants will particularly investigate the possibilities with respect to port construction in or near the Region and recommend a phased programme of construction of port facilities designed to meet the demand for transport at reasonable cost.

The consultants will review all information regarding possible port construction available from official and private agencies (Sarawak Shell Berhad) and, where necessary, guide and assist in further survey work. If necessary, model studies should be undertaken on a modest scale in order to facilitate the formulation of concrete projects in the second phase of the study.

(6) **Administration and Organisation:** The Government will provide the consultants with all relevant information on the existing framework of public administration, responsibilities, functions and interrelationships of public, semi-public and other institutions.

The consultants will also be provided with a framework of future public administration considered suitable by government for implementing the Master Plan to be prepared in Phase II. The consultants will advise on such modifications of details of this framework as are considered desirable in the light of local conditions.

(7) **Social Aspects Related to Settlement:** Existing survey information from the First, Second and Third Divisions and additional information provided by the Government (ofr. para. 13) will be used to determine how many people of various background and categories will or can be attracted to settle in the new area as farmers or in other occupations. The studies should assist in designing realistic policies with respect to recruitment and transfer of settlers, possible training programmes, and type of settlement and communities to be planned in the new area in order to achieve an orderly establishment of a harmonious, integrated society in the new area. The surveys will pay some attention to possible repercussions, or desirable adjustments to emigrant areas.

Sociological studies (and surveys) of a somewhat different nature are required in the development area in order to design policies which will guarantee satisfactory integration of the existing population in the area and the neighbouring Ulu Baram in the new society to be developed, recognising the legitimate interests of the existing population.

## (b) Phase II

21. Based on the results of Phase I of the study, an area or areas suitable for settled agriculture as required over the 20 year perspective plan period (provisionally estimated at about a quarter of million acres), will be selected for which the consultants will prepare a *semi-detailed Master Plan*. This semi-detailed plan will cover such aspects as schedule of development, possible crops, exploitation systems, settlement pattern including related infrastructural and service facilities needs and the transport network, all related to the overall development of the region, as envisaged in the perspective plan. Maps illustrating this semi-detailed plan will generally be on a scale of 1:50,000.

22. Out of the quarter million acres, the consultants will select areas to provide agricultural development of a net area of about 50,000 acres located as far as possible on unencumbered State land, and which will be developed over the first five or six years of the Master Plan period. Within the 50,000 acres of land allocated to agricultural development, in one or more blocks, which must be of economic size, the consultants will prepare a *detailed project plan* covering all sectors, activities and institutional aspects.

23. The details of the project plan must be sufficient to provide concrete guidance for immediate implementation and to facilitate orderly development under the existing planning and budget procedures of the Federal and State Governments. Suitable projects or project packages must be prepared up to internationally accepted standards so as to permit an evaluation of their economic justification.

The plan must include specific recommendations regarding institutional arrangements necessary to guarantee that the private sector will play the role which has been allocated to it.

If industrial projects outside the agro-industry are identified the consultants will discuss with the Government the desirability of additional feasibility studies being carried out and the necessary staff requirements provided from contingency services in connection therewith.

24. The following subjects will be studied during this phase of the study with varying degree of detail as determined by the different nature of the two plans:

(1) **Soils and Topography:** The object of these studies is to determine the pattern of soils and terrain characteristics within the semi-detailed Master Plan and agricultural project plan areas in sufficient detail to justify the Phase II plans. The level of work required differs in the two areas:—

**(a) Semi-detailed Master Plan Area**

It is anticipated that most of the area will have complete reconnaissance-level soil survey coverage prior to the start of the project. Topographic maps and aerial photograph coverage will also be available. A *Terrain Classification* should be prepared, based on these sources and further ground investigation. This classification should be devised following discussions with the Soil Survey Division, Department of Agriculture and should employ gradient limits common to the Soil Suitability Classification (see below).

Special attention should be given to the problem of distinguishing areas under cover which have low amplitude of relief but are deeply gullied. Due to the canopy such areas are difficult to recognise by conventional aerial photograph interpretation techniques and must be investigated by ground traverses. Subject to the availability of alternative suitable land, such areas should be excluded from the Master Plan. Soil survey within the Master Plan area should be confined to (i) broad transects and sample area studies with a view to familiarising the soils specialists with the characteristics of the area and (ii) limited formal reconnaissance-level survey to supplement the available data with a view to the preparation of the semi-detailed projects plan area.

**(b) Detailed Projects Plan Area**

The consultants will prepare a semi-detailed soil map from which a soil suitability map will be derived. The semi-detailed soil survey will cover the entire 50,000 acres and will be conducted on a grid-sampling programme. The minimum soil sampling density will be 600×75 metres in upland areas where topographic maps will assist in interpolation of soil boundaries and 400×75 metres in floodplain areas where boundaries must be interpolated largely on the basis of the sampling data. The soil classification used shall be that developed by the Soil Survey Division, Department of Agriculture, and the soils should be mapped at the level of families or series, compound mappings units being avoided wherever possible. Phase distinctions of agricultural significance should be mapped where the scale allows. Close liaison will be maintained with the senior staff of the Soil Survey Division during the course of these duties. The Department of Agriculture will provide correlation services and will make available all relevant records, reports and maps prepared previously for this region and surrounding areas. *The Soil Suitability*

*Map*, which will be a reinterpretation from the basic soil and terrain classification data, will be guided as far as practicable by the classification recently standardised for Malaysia, details of which will also be provided by the Soil Survey Division.

It is expected that sufficient soil and other pertinent information will be available before the commencement of the study for the consultants to identify the detailed projects plan area (or areas) in the early stages of the Phase studies, thus permitting the commencement of semi-detailed soil survey within the area before the start of Phase II.

Implementation of development plans within the detailed projects plan area is phased to follow immediately on from the Phase II study. In locating the 50,000 acres, the consultants should avoid the inclusion of large tracts of floodplain land if the development of such land can only take place following lengthy drainage investigations subsequent to Phase II. If such land is included in the detailed projects plan area then appropriate drainage studies and recommendations must be included in the Phase II investigations.

The detailed projects plan is based on the immediate development of 50,000 acres. Terrain and soils in much of the study area are known to be varied. The consultants must anticipate that semi-detailed soil survey in excess of 50,000 acres will be necessary to achieve this amount of developable land.

(2) **Agriculture** (agronomic and agricultural economic): These studies will be designed to evaluate the crop or crops most suited, in both agronomic and economic terms, to particular areas within the Master Plan and project plan areas. They will include a consideration of the possibilities for new economic crops as well as expanding those crops such as rubber, oil palm, coconuts and pepper which are already established in the region. Animal husbandry, particularly the possibility of cattle rearing should be covered, as should freshwater fisheries on both a commercial and smallholders scale.

Consideration should be given to the possible introduction of drainage and irrigation facilities within the semi-detailed Master Plan area. In particular the possibility of developing alluvial soils along the rivers in conjunction with the neighbouring high land may require particular attention in this context.

Relevant aspects of marketing and production economics, jointly with more general economic aspects such as desirable income levels, must be combined with agronomic aspects in the evaluation and selection of crops, cropping patterns, farm size and farm organisation.

(3) **Forestry**: An inventory survey of the potential forest resources in 2 units covering an area of 604,000 acres is being completed by the UNDP/FAO team and the Forest Department, as well as pre-investment studies for the establishment of timber industries and necessary infrastructures for the evacuation of timber products internally and externally. Accordingly plans will have been formulated for forest management and the development of timber industries in the region. The UNDP/FAO team will provide plans for the exploitation and management of the forests outside their inventory areas, by adapting plans and programmes drawn up for those inventory areas, to the requirements of the inventory carried out by

the consultants. Particular attention should be given to the zonation between forestry and other land use and to the phasing of forest exploitation with land development in the semi-detailed Master Plan.

In this connection it will be necessary for the consultants to liaise closely with the Forest Department and the UNDP/FAO Project personnel, the latter being available till August 1973, from whom data and plans relating to forestry development are to be obtained.

**(4) Mining:** Geological data for the region indicate that metalliferous mineral exploitation possibilities are very limited, and no additional geological surveys or mineral prospection exercises are warranted in view of the fact that conflicts in land use allocation likely to arise from this cause are minimal.

In recent years useful roadstone sources have been identified in close proximity to the new Miri-Bintulu highway, while hydrological conditions are not encouraging in terms of underground water supply prospects, so that no significant input of geological expertise is necessary to meet the objectives of the regional study. Technical advice on these matters can be provided by staff of the Geological Survey when required by the Consultants.

**(5) Water Resources and Hydrology:** The consultants will assess the long term requirements of water for urban, industrial and agricultural use, locate the possible sources of water supply and propose a phased schedule of investments. Detailed projects will be prepared for facilities required during the first 6 years of development with due regard to costs and longer term developments.

The possible changes in the regime and discharges of rivers and their consequences as a result of use of water for various purposes, of discharge of waste water and of development activities in general including resulting ecological and environmental changes, will be studied. Necessary water management or conservancy measures should be indicated, whenever flooding, silting and pollution in the lower reaches of the rivers are expected to increase beyond acceptable limits. Due weight must be given to the transport function of the rivers in this context.

**(6) Industry, Commerce and Services:** The consultants will make detailed projections of the developments in these sectors over the first six years as determined, directly or indirectly, by the developments in the primary sectors or as justified, possible and desirable as autonomous activities, provision for which should be covered as mentioned at the end of para 23.

The consultants will discuss the role of the private sector in these activities and suggest, with necessary details of organisation, manpower and financing, any supporting activities which may be desirable in the public sector. The consultants will moreover discuss additions to or changes in existing policies as may be desirable.

Direct public participation in these areas of activity must be developed in detail as projects.

**(7) Settlement Pattern and Infrastructural Facilities:** The consultants will recommend suitable settlement patterns for new townships and villages or expansions to existing towns and villages.

The consultants will determine the requirement of power, water and sewage, select the most economic methods of supply and prepare projects as necessary. The consultants will further determine the requirements of social services such as health and educational facilities for each township and village.

(8) **Transport:** The consultants will prepare transport projects, whether they are port facilities, waterways, main roads, rural roads or other facilities, as required over the first six years of development. The consultants will estimate the requirements for transport equipment and prepare suitable projects whenever public transport operations are recommended.

(9) **Manpower:** The consultants will prepare detailed manpower projections for the first six years for the public and private sector and compare these projections with characteristics of the settlers.

The consultants will recommend suitable short term programmes of training and recruitment as may be necessary to overcome temporary shortages of manpower of particular levels and skills.

(10) **Financing:** The consultants will prepare detailed funding requirements for the six year period, for the public and the private sector. The consultants will suggest a feasible financial programme to meet the funding requirements.

(11) **Administration and Organisation:** In the light of information provided by the Government to the consultants the latter will recommend suitable institutional arrangements necessary to implement the first six years of the development programme within the context of the longer term Master Plan. Institutional arrangements will cover the whole field between farmers associations or co-operatives to the general frame-work within which the Governments must implement the programme and must guide the different groups and sectors in a joint effort of harmonious development.

The consultants will pay particular attention to the institutional arrangements regarding the transfer to and settlement on the area of people of different origin and background.

### PART III: ADMINISTRATIVE ASPECTS OF THE STUDY

#### (a) Co-ordination and Logistics

25. The study will be sponsored jointly by the Federal Government of Malaysia and the State Government of Sarawak. The two Governments will set up a joint Steering Committee to which the Consultants will be responsible and which will facilitate co-ordination between the Consultants and all Government Agencies. The Office of the State Financial Secretary will act as Secretariat to the Steering Committee.

26. The Consultants will set up headquarters in Miri, the capital of the Fourth Division, where adequate facilities are available both for work and living. To facilitate field work in the development area, the State Government will make simple facilities available in Bintulu or elsewhere as necessary. The State Government will also make some office space available in Kuching to accommodate consultants when visiting the State Capital. The State Government will further appoint a co-ordinator in Kuching to facilitate contacts with Federal and State agencies and a liaison officer in Miri, to facilitate day by day contacts with Government agencies in the Fourth Division and to assist in general administrative matters.

**(b) Reports**

27. The results of Phase I of the study will be submitted to the Steering Committee in two substantive reports. One report will contain the Zonation Plan and can probably be submitted after about 6 months and the other report will contain the Perspective Plan, to be submitted at the end of Phase I. These reports will be reviewed and discussed within the Governments and between the Governments and the Consultants. The Government will then give the necessary approvals and directives as required for more detailed planning in Phase II such as, for example, regarding the selection of areas to be included in the Master Plan and the detailed Projects Plan.

28. The Master Plan report and the detailed Projects report will be submitted at the end of Phase II in one or more documents as required. The Consultants are expected to schedule the work in a way which will permit the Government to review and discuss drafts of these reports in time for inclusion of pertinent observations and decisions in the official final reports.

## APPENDIX II

### MIRI-SINTULU REGIONAL PLANNING STUDY

#### THE APPROACH TO PHASE II

The Agreement between the Government of Malaysia and the Consultants makes it clear, in Article III, that the objective of Phase II of the Study is to prepare, within the context of the broad Perspective Plan prepared during Phase I

"a semi-detailed Master Plan, sufficient to meet the proposed settlement requirements for 20 years (currently estimated at about a quarter of a million acres of permanent crop land) and supplemented by detailed project plans for short-term sectoral activities, in the form of investment packages, to cover immediate development requirements during the last part of the Second Malaysia Plan and the Third Malaysia Plan (currently estimated at about 50,000 acres of permanent crop land).

The Scope of Work, attached as Schedule 'A' to the Agreement, defines the required Master Plan further. Paragraph 21 states that—

"an area or areas suitable for settled agriculture, as required over the 20-year Perspective Plan period (provisionally estimated at about a quarter of a million acres) will be selected for which the consultants will prepare a semi-detailed Master Plan. This will include, in such aspects as schedule of development, settlement patterns, related infrastructural and service facility needs and the transport network, all related to the overall development of the region as envisaged in the Perspective Plan.

## APPENDIX II

Paragraph 22 of the same Schedule goes on to state that—

"out of the quarter million acres, the Consultants will select areas to provide agricultural development of a net area of about 50,000 acres located as far as possible on unencumbered State Land, and which will be developed over the first five or six years of the Master Plan period. Within the 50,000 acres of land allocated to agricultural development, in one or more blocks which must be of economic size, the Consultants will prepare a detailed project plan covering all sectors, activities and institutional aspects".

The Study Area is very large, and it was clearly not possible in the time available—not was it for other reasons desirable—to cover planning of the whole of it to the level of master planning achieved in Johor Tenggara, or even in Pabang Tenggara. A concentration of effort on planning those developments likely to take place over the next 20 years, within the overall framework of a development structure and socio-economic targets set out in the Perspective Plan, was entirely logical. It was—and is—a concept entirely acceptable to the Consultants. It does however clearly imply concentration of agricultural development during Phase II of the Study, on the selected area of about 50,000 acres of unencumbered land, which again was a reasonable proposition provided the area comprised one large block or a very few smaller ones.

## APPENDIX II

### MIRI-BINTULU REGIONAL PLANNING STUDY

#### THE APPROACH TO PHASE II

The Agreement between the Government of Malaysia and the Consultants makes it clear, in Article III, that the objective of Phase II of the Study is to prepare, within the context of the broad Perspective Plan prepared during Phase I,

“a semi-detailed Master Plan, sufficient to meet the projected settlement requirements for 20 years (currently estimated at about a quarter of a million acres of permanent crop land) and supplemented by detailed project plans for short-term sectoral activities, in the form of investible packages, to cover immediate development requirements during the later part of the Second Malaysia Plan and the Third Malaysia Plan (currently estimated at about 50,000 acres of permanent crop land).

The Scope of Work, attached as Schedule ‘A’ to the Agreement, defines the required Master Plan further. Paragraph 21 states that—

“an area or areas suitable for settled agriculture, as required over the 20-year Perspective Plan period (provisionally estimated at about a quarter of a million acres) will be selected for which the consultants will prepare a semi-detailed Master Plan. This semi-detailed plan will cover such aspects as schedule of development, possible crops, exploitation systems, settlement pattern including related infrastructural and service facility needs and the transport network, all related to the overall development of the region as envisaged in the Perspective Plan.

Paragraph 22 of the same Schedule goes on to state that—

“out of the quarter million acres, the Consultants will select areas to provide agricultural development of a net area of about 50,000 acres located as far as possible on unencumbered State Land, and which will be developed over the first five or six years of the Master Plan period. Within the 50,000 acres of land allocated to agricultural development, in one or more blocks which must be of economic size, the Consultants will prepare a detailed project plan covering all sectors, activities and institutional aspects”.

The Study Area is very large, and it was clearly not possible in the time available—nor was it for other reasons desirable—to cover planning of the whole of it to the level of master planning achieved in Johor Tenggara, or even in Pahang Tenggara. A concentration of effort on planning those developments likely to take place over the next 20 years, within the overall framework of a development structure and socio-economic targets set out in the Perspective Plan, was entirely logical. It was—and is—a concept entirely acceptable to the Consultants. It does however clearly imply concentration of agricultural development, during Phase II of the Study, on the selected area of about 250,000 acres of unencumbered land, which again was a reasonable proposition provided the area comprised one large block or a very few smaller ones.

The situation as it has been found to be in reality has made this approach rather less practicable. In the first place less unencumbered State land has been found for agricultural development than was expected. If 'unencumbered' is taken to mean land which is owned by the State, for example, not under title or under Native Customary Right—the total area of land possibly suitable for agriculture amounts to 370,000 acres, exclusive of the Lambir-Subis Area of 144,000 acres. If Forest Reserves and Protected Forests are excluded, the gross acreage of 'totally unencumbered' possibly suitable land amounts to 205,000 acres. When allowance is made for areas eliminated due to unfavourable soil and terrain characteristics following further investigations and when further deductions are made for areas to be used for roads, villages, etc., the net acreage available may well be reduced to about 225,000 acres of 'unencumbered' land and 150,000 acres of 'totally unencumbered' land.

In the second place, whatever the figure used, the distribution of this land is scattered, few blocks being really large though the location of the bulk of this land is rather well-placed in relation to the Miri-Bintulu trunk road. In addition there is far more land encumbered by shifting cultivation than was originally expected, whether the Customary Rights on State land are legally established or not. All these factors can be used to reinforce the argument that development over the next 20 years should be spread than concentrated. The fact that the distribution of suitable land for settlement is as it is, also means that (economic) efficiency of development is not in any major way sacrificed in favour of the (social) principle of equality. It can be added that for economic, social and political reasons an improvement of conditions in already occupied areas is desirable; and these improved conditions should, in the long run, contribute to a diminishing of shifting cultivation.

If this general argument is accepted, then we would redefine the objectives of Phase II as: the preparation of an overall regional development plan for the Study Area, with the major emphasis on:

- (a) A development programme for the next 20 years, which should include a land settlement or agricultural development programme covering about 250,000 acres of land,
- (b) An agricultural action programme for the early development of about 50,000 acres of land, and
- (c) A related action programme up to 1980 for the development of the other sectors of the economy.

Such an interpretation of the objectives for Phase II of the Study would be, we believe, to the benefit of Sarawak, and would imply no change in the Terms of Reference or Scope of Work. It would, however, seem desirable to alter the title and structure of Phase II which is at present described in Article III as the Master Plan Report. It is suggested that this should now simply become the Final Report, probably consisting of three main parts, backed up by supporting material as necessary. These three parts could be:

- (a) Regional Development Structure and Targets.
- (b) The Development Programme (Master Plan) to 1990.
- (c) The Action Programme to 1980.

This structure would allow a certain updating and refinement of the Perspective Plan during Phase II. This aspect is not provided for at present. The whole report preparation sequence would then be:

1. Zonation Plan
2. Perspective Plan
3. Draft Development Programme (Master Plan)
4. Final Report Draft
5. Final Report (printed form).

Our approach to Phase II would require some changes from the original proposed staffing, but the Study would remain within the stated time and cost limits. The changes proposed would consist in the main of transfer of time from Specialist Reserve (List D in the Agreement) in order to extend the time available to certain present team members (notably, general economics, regional and town planning, and sociology) and the concentration of civil engineering inputs onto town water supplies, sewage and effluent disposal etc., since irrigation and drainage schemes seem unlikely to figure in the early action programme.

A complete statement of staff changes, with justification for the envisaged inputs, is attached together with a recast bar-chart.

We would appreciate an early meeting to discuss the Phase II work and staffing programme, since it is important to reach firm decisions before the actual work of Phase II develops too far.

## APPENDIX III

### ACKNOWLEDGEMENTS

The Regional Planning Studies for this report were carried out in collaboration with the Economic Planning Unit of the Prime Minister's Department and the Secretariat of the State Government of Sarawak. The assistance and co-operation of both is gratefully acknowledged. Many other State and Government agencies contributed substantially to the work in various ways. Those which participated directly in project activities by providing counterpart staff and/or services were:

#### IN KUCHING

#### MINISTRY OF LANDS AND MINERAL RESOURCES

##### Department of Agriculture—Soil Science Division

This Division by the provision of staff assisted throughout in the reconnaissance and semi-detailed soil survey activities, in the collection of soil samples and the collection and analysis of agronomic data.

Assistance was also provided in the sociological studies.

##### Forest Department

This department by sending staff assisted throughout in the reconnaissance of the forests within the study area and contributed staff in a variety of the reconnaissance potential of logged forest areas.

##### Drainage and Irrigation Division

Assistance was provided throughout the hydrological studies and all stream flow records and data were made available. The department also carried out analyses of water samples.

##### Land and Survey Department

This department by sending staff assisted greatly in the collection and analysis of planning data and in the preparation of the town plans. Much technical reproduction and map processing was also undertaken by them.

#### CHIEF MINISTER'S DEPARTMENT

##### Sarawak Economic Development Corporation

Assistance and staff were provided throughout the study in the collection and analysis of trade and industrial statistics.

#### MINISTRY OF COMMUNICATIONS AND WORKS

The Public Works Department provided cost and design criteria in connection with ports, traffic, roads, water and sewerage supplies and staffing.

## APPENDIX III

### ACKNOWLEDGEMENTS

The Regional Planning Studies for this report were carried out in collaboration with the Economic Planning Unit of the Prime Minister's Department and the Secretariat of the State Government of Sarawak. The assistance and co-operation of both is gratefully acknowledged. Many other State and Government agencies contributed substantially to the work in various ways. Those which participated directly in project activities by providing counterpart staff and/or services were:

#### IN KUCHING

#### MINISTRY OF LANDS AND MINERAL RESOURCES

##### **Department of Agriculture—Soil Science Division**

This Division by the provision of staff assisted throughout in the reconnaissance and semi-detailed soil survey activities, in the correlation of soil series and the collection and analysis of agronomic data.

Assistance was also provided in the sociological studies.

##### **Forest Department**

This department provided much useful data on the current status of the forests within the study area and contributed staff to a survey of the regeneration potential of logged forest areas.

##### **Drainage and Irrigation Division**

Assistance was provided throughout the hydrological studies and all stream flow records and data were made available. The department also carried out analyses of water samples.

##### **Land and Survey Department**

This department by seconding staff assisted greatly in the collection and analysis of planning data and in the preparation of the town plans. Much technical, reproduction and map processing was also undertaken by them.

#### CHIEF MINISTER'S DEPARTMENT

##### **Sarawak Economic Development Corporation**

Assistance and staff were provided throughout the study in the collection and analysis of trade and industrial statistics.

#### MINISTRY OF COMMUNICATIONS AND WORKS

The Public Works Department provided cost and design criteria in connection with ports, traffic, roads, water and sewerage supplies and staffing.

# IN KUALA LUMPUR

## PRIME MINISTER'S DEPARTMENT

The Statistics Department assisted throughout the study in connection with population, trade and industrial statistics.

### SURVEY DEPARTMENT

The printing of the series of resources and planning maps was undertaken by the Directorate of National Mapping Staff.

Many other Federal and State departments and public agencies also assisted the study by providing data.

Information was also received from a number of public or official bodies not directly within Federal or State Ministries. Within the private sector much material was provided on cultivation of rubber and oil palms by the estate agencies and on other possible activities by many organisations, businesses and individuals, too numerous to mention both inside and outside Malaysia.

Finally much useful information was obtained from many individual households, who co-operated in the various socio-economic surveys.

To all these organisations and individuals the consultants extend their warmest thanks.

# APPENDIX IV

## STUDY ORGANISATION

FEDERAL GOVERNMENT  
OF MALAYSIA

SARAWAK STATE  
GOVERNMENT

GOVERNMENT LIAISON  
A. SILVANATHAN (1971-73)  
A. NASAIN (1973-75)  
R. LAJ  
S. MENANGI

STUDY OFFICE  
(MTR)

PROJECT MANAGER  
C. A. MATHISON

DEPUTY PROJECT  
MANAGER  
M. H. F. COOPER

THE ASSOCIATION PRINCIPALS

NATURAL RESOURCES AND LAND USE  
HUNTING TECHNICAL SERVICES LTD, LONDON  
V. C. ROBERTSON, MANAGING DIRECTOR  
R. J. MCGRIBBIN, DIRECTOR AND ASST. MGR

INFRASTRUCTURE PLANNING AND DEVELOPMENT  
GIPS & OVERGAARD, COPENHAGEN  
B. NGFF, DIRECTOR  
K. R. OVERGAARD, DIRECTOR

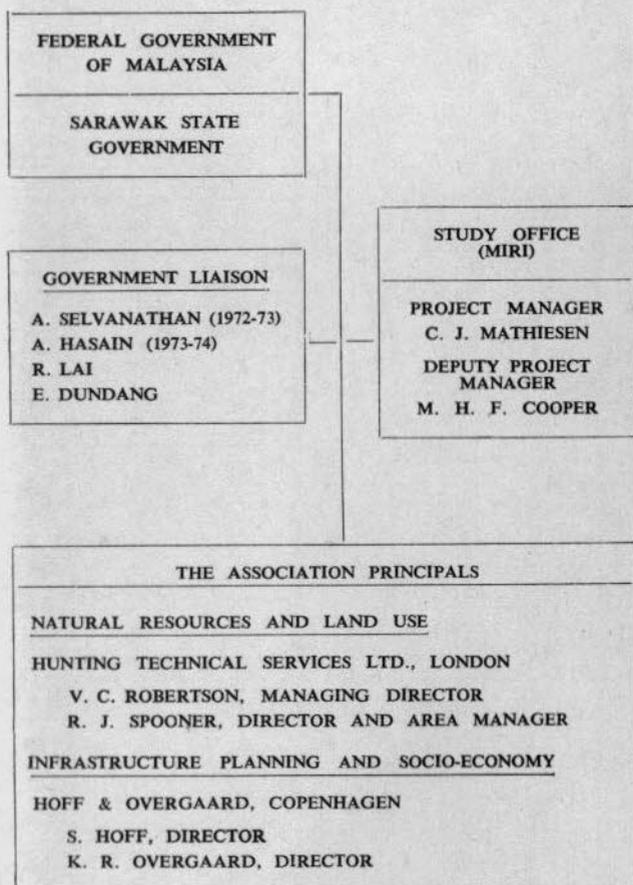
Agriculture, Forestry and Wildlife		
<b>Conservation Staff</b>		
Senior Assistant	M. P. Cooper	20
Assistant Forester	P. Arnold, D.M.	20
Agri-cultural Extension Clerk	T. C. Anderson	10
Agri-cultural Planner	J. V. Hillman	10
Forester (General)	R. A. J. Manton	10
Forester (Specialist)	W. L. A. Fenn	10
Marketing Extension	J. Ross	10
Wildlife Officer	K. P. Selwood	10
Conservation Staff		
Administrative	C. E. A. Bell	
<b>Forestry</b>		
Forester	D. N. McVee	10
Research Assistant (Wild)	J. E. Staines	10
<b>Fishing</b>		
Extension	C. L. Clarke	10
Research/Outreach	D. A. Miller	10
<b>Soil</b>		
<b>Conservation Staff</b>		
Senior Land Classifier	J. A. Vennart	20
Land Classifier	S. D. Lee	10
Conservation Specialist	M. P. Hillman	10 (1973)
<b>Conservation Staff</b>		
Soil Specialist	C. P. Lee	
<b>Water</b>		
<b>Conservation Staff</b>		
Soil Specialist	J. Smith	10
Water Specialist	R. Matthews	10
Soil Specialist	J. P. Lee	
<b>Infrastructure, Rural and Urban Development</b>		
<b>Conservation Staff</b>		
Research Officer	S. J. Cooper	10
Physical Planning Officer	L. Lee	10
Extension Planner	J. J. Wainwright	10
Senior City Engineer	J. Cooper	10 (1973)
<b>Conservation Staff</b>		
Regional Planner	C. M. G. Gifford	
Urban Engineer	D. Lee	
Senior Town Planner	A. Lee	
Planning Officer	A. Ng	
Regional Planning Officer	S. Lee	
	Lee Hui Lin	
<b>Water Resources</b>		
<b>Conservation Staff</b>		
Water Resources	C. J. Matthews	10
General Forester	M. Lee	10
General Assistant	J. N. Matthews	10
Microbiological Specialist	H. J. Martin	10
Biologist	C. A. Miller	10
<b>Conservation Staff</b>		
Forest Strategist	H. R. Taylor	
General Forester	J. Cooper	
<b>Administration</b>		
Administrative Manager	R. J. Warren	20
Supply and Stores	R. B. Tucker	10
Production		

# APPENDIX IV

Note: Individual Conditions and rates in Sarawak is indicated by brackets and unless otherwise stated all rates in dollars.

# APPENDIX IV

## STUDY ORGANISATION



<b>Agriculture, Livestock and Fisheries</b>		
<b>Consultant Staff</b>		
Senior Agriculturist	M.H.F. Cooper	(24)
Agricultural Economist	F. Sole/R. I'ons	(24)
Agricultural Extension/Credit	T.V. Anderson	(4)
Agricultural Planner	J.V. Harbord	(2)
Fisheries Specialist	R.A.J. Harrison	(3)
Livestock Specialist	W.J.A. Payne	(2)
Marketing Economist	J. Joyce	(2)
Scientific Adviser	R.W. Kettlewell	(1)
<b>Counterpart Staff</b>		
Agriculturist	C.K.K. Ngui	
<b>Ecology</b>		
Ecologist	D.N. McVean	(1)
Research Specialist (Niah)	R.E. Stebbings	(1)
<b>Forestry</b>		
Enumeration	C.L. Carrier	(14)
Inventory/Utilisation	F.S. Walker	(9)
<b>Soils</b>		
<b>Consultant Staff</b>		
Senior Land Classifier	I.L.A. Ysselmuiden	(20)
Land Classifier	R.D. Law	(12)
Conservation Specialist	N.W. Hudson	(10 days)
<b>Counterpart Staff</b>		
Soil Surveyor	C.P. Lim	
<b>Water</b>		
<b>Consultant Staff</b>		
Hydrologist	J. Stowell	(31)
Drainage/Public Utilities	A.K. MacDonald	(6)
<b>Counterpart Staff</b>		
Hydrologist	T.K. Then	
<b>Infrastructure, Rural and Urban Development</b>		
<b>Consultant Staff</b>		
Regional Planner	S. Jorgensen	(23)
Physical/Town Planner	L. Skule M. Breyen	(8)
Transport Planner	T.E. Wetteland	(12)
Senior Port Engineer	T. Sorensen	(17 days)
<b>Counterpart Staff</b>		
Regional Planner	Chia Pit Chung	
Highway Engineer	D. Chua	
Assistant Town Planner	A. Goh	
Planning Officer	A. Ng	
Assistant Planning Officers	R. Jong Tay Eng Lee Lay Hua Lee	
<b>Socio-Economy</b>		
<b>Consultant Staff</b>		
Chief Economist	C.J. Mathiesen	(24)
General Economist	M. Juul	(23)
Financial Analyst	F.H. Anderson	(9)
Sociological Specialist	H.S. Morris	(24)
Sociologist	C.A. Sather	(12)
<b>Counterpart Staff</b>		
Rural Sociologist	H.B. Solhee	
Sarawak Museum	T. Kaboy	
<b>Administration</b>		
Administrative Manager	H.A. Rancom	(25)
Survey and Report Co-ordinator	R.B. Tucker	(25)

**Note:** Individual Consultant Staff time in Sarawak is indicated in brackets and unless otherwise stated is shown in months.

