LEMBAGA KEMAJUAN TANAH PERSEKUTUAN

FEDERAL LAND DEVELOPMENT AUTHORITY

MALAYSIA

THE JENGKA TRIANGLE REPORT

THE OUTLINE MASTER PLAN

TIPPETTS-ABBETT-McCARTHY-STRATTON

HUNTING TECHNICAL SERVICES LIMITED

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25th January 1967.

Tan Sri Taib bin Haji Andak,
The Chairman,
Federal Land Development Authority,
KUALA LUMPUR.

Dear Sir,

In accordance with the Agreement dated 21st June 1965 between The Federal Land Development Authority and the consultants, we submit herewith the Jengka Triangle Report.

This report presents the findings of the varied studies made of the Jengka Triangle in the 18-month period July 1965 to December 1966 and the recommendations for its orderly development under a comprehensive regional master plan.

The Jengka Triangle project is an important element in the further economic development of Malaysia. We wish to record our appreciation of the opportunity to participate in this undertaking, and to acknowledge the considerable cooperation and support provided by the Federal Land Development Authority.

Respectfully submitted,

TIPPETTS-ABBETT-McCARTHY-STRATTON * HUNTING TECHNICAL SERVICES, LTD.

E.K. Bryant
Partner

V.C. Robertson
Director

CONTENTS

FIGURES

CHAPTER 1
INTRODUCTION

Purpose and Scope

The study which is presented in this report was carried out for the Federal Land Development Authority (FLDA) under an Agreement with the consultants dated June 9th 1965.

This Agreement requires that

"The Consultants will prepare a comprehensive regional Master Plan for the development of the Jengka Triangle. This will consist of a plan of land development and settlement supplemented with subsidiary industries based on the agricultural production to be developed and on the economic utilisation of the indigenous forest resources in accordance with the specific objectives set forth in Schedule A hereto."

That part of Schedule A (Scope of work) which refers specifically to planning objectives is given in full below.

1. Land Use - To develop a land use plan which will delineate the areas for agriculture, forestry, villages, towns, processing and industrial centres, and transportation facilities.
2. Agricultural Settlement Schemes - To plan agricultural schemes composed of economically viable smallholdings of optimum size, their disposition, layout and cropping pattern, appropriately grouped in relation to the location and capacity of collection and processing centres. Consideration will be given to the part that estate agriculture can play in promoting such development.
3. Forest Exploitation - The orderly exploitation of the forest resources of the Triangle, based primarily on timber obtained from the clearing of agricultural land and to a lesser extent on timber extracted on a sustained yield basis from areas to be retained as permanent forest.
4. Transportation - To plan a transport system that will facilitate the internal development of the Triangle and give effective external links.
5. Industrial Development - To make provision for industrial facilities for processing the agricultural, forest, and other products of the Triangle, taking into account the type, capacity, and siting of processing plants required, their phasing and the techniques that should be employed in them.
6. Community Development - To plan for new towns and villages in relation to the development of production and processing, to determine their most suitable location, size and composition, and to prepare prototype designs for their layout.
7. Project Formulation and Preliminary Evaluation - To integrate plans for agricultural settlements, other communities, industrial processing centres, and transportation facilities into economically viable project units, each capable of independent implementation, and to establish the economic justification for

individual projects.

8. Phasing of Project Implementation - To prepare schedules for orderly development of projects and to suggest priorities for the implementation of individual projects comprising the overall Triangle development, having regard to the relative economic merits of the projects, to the need for development of common services such as major transportation facilities, and the administrative, managerial and physical capacities required for implementation.

9. Outline Master Plan - To prepare a realistic outline Master Plan for the development of the Jengka Triangle incorporating the individual projects, their common service requirements and phasing, and to make an economic evaluation of the whole.

Contents of Report

The findings of this study are given in three volumes. The first volume contains a concise presentation of the Master Plan as a whole, its phasing and implementation, and a summary of the financial and economic analysis. This volume is designed to allow a rapid appreciation of the main features, costs and benefits of the Master Plan.

Detailed findings are given in a second volume. This consists of two parts: Part 1 - Resources for Development - which describes the physical resources of the Triangle, and Part 2 - Development Planning - which sets forth the findings of the various planning studies. The second volume therefore contains the reports and analyses of all studies undertaken and sets forth in some detail recommendations for the whole range of individual components of the Plan. Detailed supporting material is presented as a series of appendices in a third volume.

The report as a whole is supported by the map series, in addition to the figures appearing with the text. The first is at 1:63,360 scale and is contained in the map annexure. It includes:

The soils of the Jengka Triangle
Land forms
Land classification
The Master Plan.

A second map series is at 1:25,000 scale and has been submitted to FLDA separately from this report. It includes:

Soils (10 sheets)
Land classification (10 sheets)

Assistance and Cooperation of Other Agencies

The Jengka project studies were carried out in collaboration with FLDA. The Authority made available detailed information on all aspects of its activities in land development, provided liaison with a range of public and private agencies, and arranged for assistance from other government departments. An agriculturist from the Authority was seconded to the consultants for the full term of the study. The considerable assistance and cooperation of FLDA is acknowledged.

A large number of other agencies contributed substantially to the work. Those which participated directly in project activities were as follows:

Department of Agriculture - Analyses of all agricultural soil samples were carried out in the laboratory of the Soils Division, under the supervision of the Director. Assistance was also provided in correlation of Jengka soil series throughout the course of the study and available agronomic data was supplied.

Forest Department - The forest inventory was carried out with the assistance and cooperation of the Forest Department and the Forest Research Institute, Kepong. Four Foresters and eight Forest Woodsmen were seconded to the project staff for field inventory. Two research Foresters were seconded for timber defect sampling.

Survey Department - Field parties were provided by the Survey Department (Pahang) for surveys of the main north-south base line in the Triangle, and subsidiary base lines. Printing of the 1:63,360 and 1:25,000 scale map series was undertaken at Department Headquarters.

Public Works Department - Engineering tests of soils samples were carried out in the Department's soils laboratory. Two technical personnel were seconded for work on the project.

Department of Town and Country Planning - Secondment of town planning personnel and other assistance.

Geological Survey Department - Reconnaissance geological inspection of the Triangle and preparation of report and map.

Commonwealth Forestry Institute (Oxford) - Assistance in design of the forest inventory and field guidance in the organisation of that work. The Institute also undertook the computer processing of all forest inventory data.

Royal Malaysian Air Force - Aerial reconnaissance of the Triangle, as required for project work, both by fixed wing aircraft and helicopters.

Other Government Ministries and Departments and public agencies which have assisted the study by supplying data include:

Ministry of National and Rural Development
Ministry of Education
Ministry of Health
Ministry of Commerce and Industry

Police Force
National Electricity Board
Malaysian Railways
Port Swettenham Authority

Majlis Amanah Ra'ayat (MARA)
Bank Negara Malaysia
Malaysian Industrial Development Finance, Ltd.
Commonwealth Development Corporation

Economic Planning Unit

Road Transport Department
Telecommunications Department
Department of Statistics

Postal Services Department
Drainage & Irrigation Department
Department of Civil Aviation
Meteorological Service

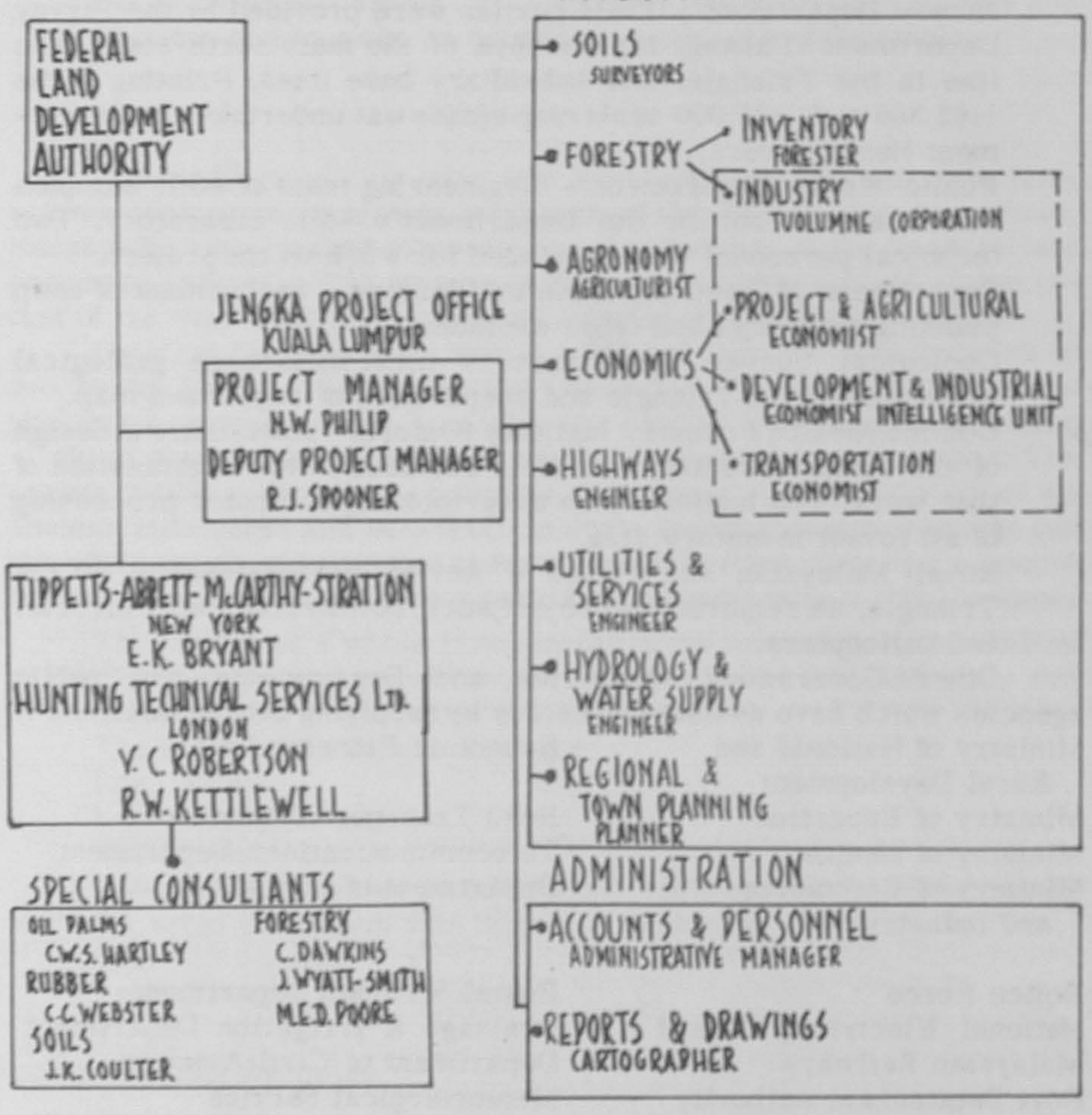
University of Malaysia
Rubber Research Institute of Malaysia
Rubber Industry (Replanting) Board
Tropical Fish Culture Research Institute

Departments of the State Government of Pahang
United Nations (Food and Agriculture Organisation)

In the private sector, much data on the two principal crops, especially on oil palms, were provided by the estate agencies and other organisations and individuals.

Study Organisation

Figure 1
Study Organisation



The consultants' study organisation for Jengka included professional staff assigned for project activities, individual consultants in soils and agriculture, and associated consulting firms in forestry and development economics (Figure 1). The studies were undertaken in the period July 1965 - December 1966.

CHAPTER 2
PLANNING APPROACH

ENVIRONMENT

Location of the Jengka Triangle is shown in Figure 2. It covers about 300,000 acres (474 square miles) of which approximately 110,000 acres on the periphery are occupied or reserved in some way. About 27,000 acres are in process of development by FLDA. The remainder is mainly under natural rain forest only a small proportion of which has been exploited.

The areas within which studies of the three basic resources, water, forests and soils took place are shown in Figure 3. The net area (189,000 acres) available for development planning is also given in Figure 3.

Climate

The climate is typical of West Malaysia with abundant rainfall and little variation in temperature throughout the year. Mean daily temperature ranges between 77° and 80° F. Annual rainfall is about 90 inches and is fairly evenly distributed; the months November through January are usually wetter than average and June and July drier. Rainfall commonly occurs in high intensity storms of limited areal extent but their frequency distribution is such that there are no significant differences in annual rainfall within the Triangle.

Topography

Most of the Triangle consists of undulating land lying between 100 and 350 feet in altitude. An intricate system of branching streams divides the Triangle into a large number of moderate to steeply incised valleys about 1/4 mile wide and 50 - 200 feet deep. The major features consist of three ridges which run north-south and rise steeply 200 to 500 feet above the surrounding land. The largest, the Jengka ridge, is 21 miles long and separates the eastern third of the Triangle from the remainder (Figure 4). The two smaller ridges are on the western side. One ridge forms the western boundary for twelve miles. The other runs parallel to it two miles to the east. The long narrow valley between these two ridges consists of predominantly level land.

Soils

The geology of the Triangle is fairly complex, both volcanic and sedimentary rocks occuring. The soils being mainly derived in situ from these rocks are correspondingly varied. The soil distribution pattern is further complicated by the network of valleys and streams and the interaction with them of the main ridges - producing a consider-

able movement and redistribution of soil material.

Thirteen soil series and five soil types not belonging to established series were mapped. These have a wide range of properties and thus of agricultural potential. Most soils except in valley floors are freely drained. Soil depth is generally moderate, from 2 to 6 feet. Although clay content is high, physical properties are better than might be expected - a factor of importance to crops. Nutrient status is generally moderately or rather low. Layers of laterite are common; variations in depth below surface and thickness of these layers also have considerable agricultural significance. Soils in the valley bottoms tend to be water-logged or subject to periodic flooding.

Soils derived from volcanic rocks (Segamat series) and from some of the sedimentary rocks (Munchong series) are the best soils in the Triangle under present conditions. Valley bottom soils (Akob and Telemong series) are less acid, have a higher nutrient status than other soils and are possibly even better than the first-named two series, when drained. Between them, these four best soils cover about 39 per cent of the Triangle (Figure 5). About 88 per cent of the area is judged suitable for agriculture.

Forestry

Most of the Jengka Triangle is under primary forest of the lowland Dipterocarp type. In the centre of the Triangle about 94,000 acres are undisturbed forest located in the Jengka Forest Reserve (Figure 6). All but a small proportion of this is suitable for logging. On the fringes of the reserve approximately 75,000 acres of forest have been partially logged.

The Jengka forests contain hundreds of timber - producing tree species. The inventory carried out covered more than 120 species considered to be of commercial importance. About 50 per cent of the stand enumerated consists of tree species currently used in the Malaysian timber industry. The remainder, mainly the medium and heavier hardwoods, comprises tree species whose timber is not at present generally used by the local industry but which, if processed, is considered to have a high commercial value in the world market. A fair quantity of timber of this type remains in the partially logged areas.

Water Resources

The area is drained into the Sungai Pahang by three tributaries, the Tekam, Jengka and Jempol (Figure 4). An intricate pattern of small streams results in all land being within 1/4 mile of a drainage line. Only the large rivers have perennial flow. All rivers and streams after heavy rainstorms are subject to short periods of flooding, consequently swamp land occurs in low lying areas. However, natural drainage in many of these areas will take place if the courses of the rivers and streams are improved and cleared.

Ample water for domestic and industrial use is available from both rivers and streams in the Triangle. There are also indications that groundwater could be economically developed.

WEST MALAYSIA

THAILAND

PERLIS

KEDAH

ALOR STAR

KOTA BHARU

PENANG

PROVINCE WELLESLEY

KUALA TRENGGANU

KELANTAN

TRENGGANU

KUALA DUNGUN

PERAK

IPOH

KUALA LIPIS

CHUKAI

THE JENGKA TRIANGLE

JERANTUT

KUANTAN

SELANGOR

PAHANG

KUALA LUMPUR

NEGRI SEMBILAN

SERDANG

KUALA PILAH

MALACCA

MALACCA

JOHORE

BATU PAHAT

KLUANG

JOHORE BAHRU

SINGAPORE

0 1 10 20 30 40 50 MILES

LEGEND

- International Boundary
- State Boundary
- Railway
- Major Road
- Secondary Road
- River

Access

The north, east and south sides of the Triangle are bounded by existing roads capable of providing access for development operations. Within the Triangle there are no roads, except rough logging tracks which penetrate for relatively short distances. The Triangle has good access to the national road and railway network. National Route II which forms the southern boundary of the Triangle links the area to Port Swettenham (145 miles), Kuala Lumpur (120 miles) and Mentekab (20 miles). At Mentekab the railway provides links with Singapore (213 miles), Kuala Lumpur (185 miles), and Port Swettenham (213 miles).

Present Economic Activity

Land outside the Jengka Forest Reserve has been logged under license on a substantial scale during 1965 - 1966 and logging is at present the principal economic activity in the Triangle. Agricultural areas in process of development by FLDA, or already alienated for other uses such as the belt of settlement along the Sungai Pahang are also important sources of economic activity within the Triangle (Figure 3). Oil palms are grown on the east side of the Triangle at the FLDA Ulu Jempol scheme and on an adjacent estate. Rubber is grown on the FLDA schemes at Sungai Tekam in the north and Kampong Awah, Sungai Nerek and Bukit Tajau in the south. The rest of the Triangle is largely unpopulated and undeveloped.

Limited commercial and social services are provided at the towns of Jerantut in the north and Maran in the southeast (Figure 4). Temerloh in the southwest is somewhat larger and is a centre of local government and available urban services.

Tekam and Surrounding Areas

The Tekam area lies immediately to the north of the Triangle, having as its southern boundary the Jerantut-Maran road. This area was the subject of a soil survey and forest inventory but is not included at this stage in planning development of the Jengka Triangle. The area is bounded by steep land on the west, north and east and covers about 60 square miles (40,000 acres). The topography is comparable to the less undulating parts of the Jengka Triangle. The soils are similar to those found in Jengka but there is a higher proportion of those best suited to agriculture (about 60 per cent in the best four soil series as opposed to 39 per cent in the Triangle proper). The soil distribution pattern is much less complex.

The Tekam Forest Reserve forms a large part of this area and consists of 31,000 acres of largely undisturbed forest. A further 4,000 acres has been partially logged, but still contains quantities of useable timber. The composition of the forest is very similar to that of the Triangle. The area is drained by the Sungai Tekam (Figure 4).

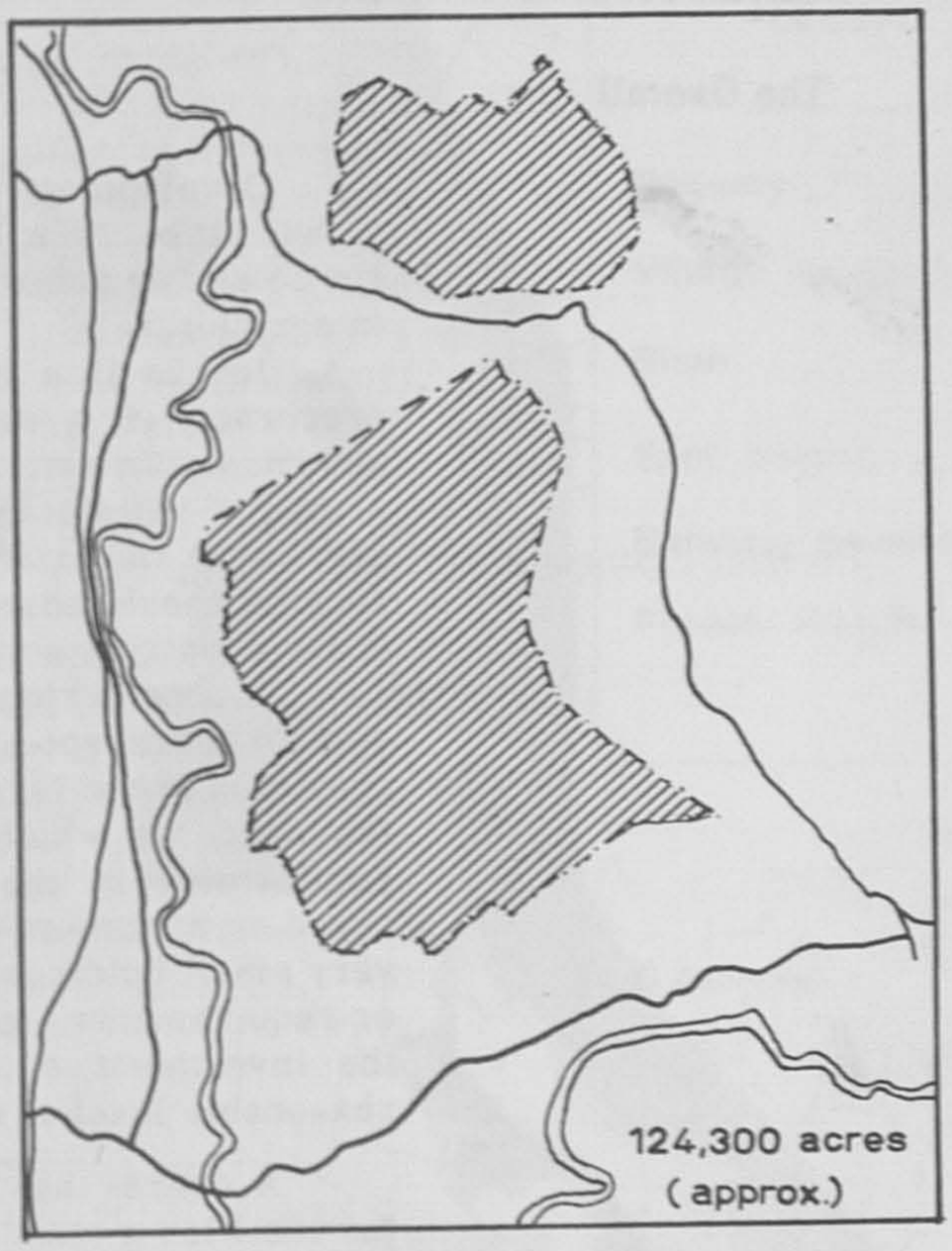
The 2 to 3 mile strip which separates the Triangle from the east bank of the Sungai Pahang is widely cultivated, mainly under rice, and supports a number of small villages along the river. There are seven sawmills taking timber from the Triangle, Tekam and the surrounding areas.

Figure 3

SURVEY AND PLANNING AREAS

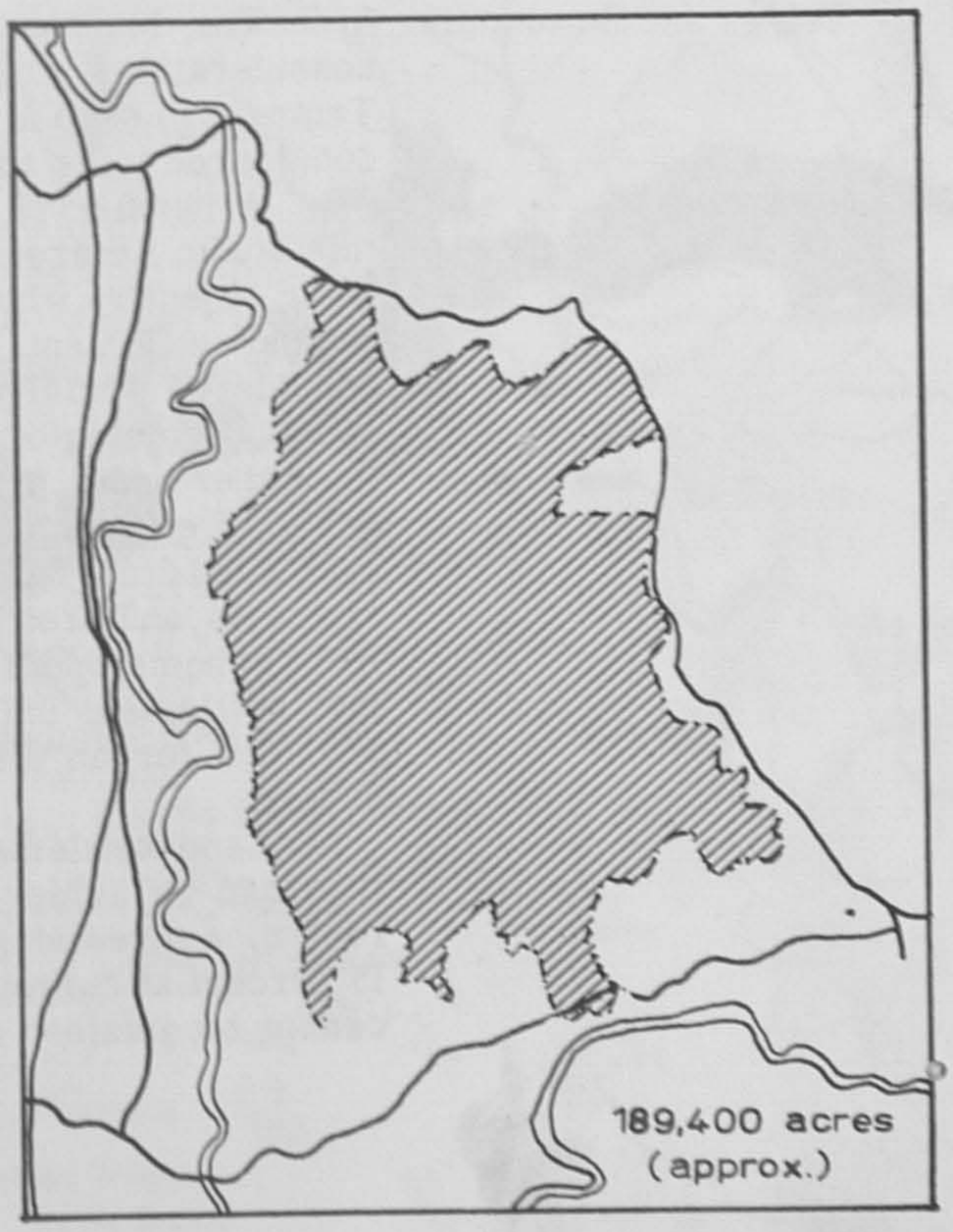
HYDROLOGY

FORESTRY



SOIL SURVEY

DEVELOPMENT PLANNING



OBJECTIVE AND REQUIREMENTS

The Overall Aim

Development of the Jengka Triangle is a very major enterprise. It will take up a large part of Malaysia's development effort in the public sector and will require a substantial share of public investment in agriculture.

Jengka is a large enterprise in itself but it is also the probable precursor of a series of major land settlement and development schemes. The extent to which development of the Triangle succeeds in setting a satisfactory pattern for such future schemes is therefore of particular importance. For this reason it is important that the Plan adopted should be related not only to the needs of FLDA but to the needs of the country's economy as a whole.

In considering this broad aim it has been necessary to reconcile certain more specific objectives which in some cases conflict. The provision of the largest possible number of employment opportunities - the need for which is clearly demonstrated by the extent of under-employment in the rural sector today - might suggest an approach based on maximum density settlement. This implies settling people on very small holdings, which would not be consistent with other objectives or requirements - principally the achievement of an adequate return on the investment of capital, and the achievement by the settler of a reasonable level of cash income.

A course has been adopted therefore which provides as a basis for the Plan a standard - sized, relatively large holding - recognising that this reduces a number of employment opportunities but stressing the importance of providing an acceptable standard of living for the settler coupled with a reasonable return on capital invested.

The Master Plan presented integrates these socio-economic considerations with the proper use of the physical resources of the Triangle in such a way as to provide a pattern of development which is considered to be advantageous both to FLDA and the Nation.

A number of planning objectives were specified at the start of this study. Reference has already been made to them in Chapter 1. The basic objective which becomes a distinctly limiting requirement is that of land settlement. It has been concluded that land settlement (and it is considered socially very important that settlement should imply the eventual gaining of title of land) is inconsistent with estate-type operation either under private or public auspices. The estate system provides a highly efficient form of land development but the working force is precluded from full participation in the management of the land and the rights in and profits from it. Jengka is planned therefore as a settlement scheme operated by individual smallholders, these being grouped into settlement units, each growing a single main crop. The system provides for an effective utilisation of management which is in short supply.

Land settlement does imply, however, a lower return on capital than can be achieved by estate production. The expected commercial return on investment in Malaysia is high (probably in the region of 12 to 15 percent at current prices) but returns on investment as high as this cannot be obtained from a settlement scheme. A lower level of labour

Figure 4

THE JENGKA TRIANGLE

TEKAM FOREST RESERVE

JENGKA FOREST RESERVE

JERANTUT

TEMERLOH

MARAN

Kg Rial
Kg Betong
Kg Tanjong Gatal
Br Jerantut
Kg Paya Tampak
Kg Pedah
Kg Priba
Kg Kedondong
Kg Mesjid
Kata Jin
Jeransang
Kg Sokti
Kg Batu Leja
Sungai Tekam (FLDA)
Kg Kelola
Kg Bukit Gajah
Kg Tebing Tinggi
Kg Kepala Pulau
Gong Hair
Kg Bukit Ketupat
Kg Angut
Kg Tenggok
Br Galong
Ulu Jempol (FLDA)
Br Klang
Kg Jambu
Kg Sekoh
G Senyum
Kg Angut
Kuala Kerau
G Berantai
Kg Telok Sabak
Kg Perenjak
Kg Kuala Sentol
Kg Jenderak
Kg Batu Sawar
Tekal Hair
Kg Dingkir
Kg Tanjong Kabong
Br Jenadi
Bukit Tajau (FLDA)
Kerdau
Kg Telok Sentang
Pulau Jerijak
Br Tinggi
Bukit Kuain Hair
Kg Ketam
Kg Sanggang
Sungai Nerek (FLDA)
Kg. Awah (FLDA)
Kg Gumbai
Kg Kuala Jempol
Br Gemok
Kg Bintang
Kg Awah
Kg Bongkok
Kg Gantok
Kg Paya Banir
Kg Chenor
Kg Sawah
Br Tinggi
Kg Sekreta
Mentekab
Kg Pisang
Kg Dalam
Kg Gumai
Kg Tanjong Melati
Br Kertau
Kg Tualang
Kg Rotan Sega
Kertau
Kg Manggis
Kg Sentang
Kg Kening
Kg Tanjong Batu
Kg Batu Bor
Kg Puchong
Kg Lubak Kechik
Kg Belengu
Kg Puyu
Kg Tebing Tinggi
Kg Paya Kundang
Kg Bohor
Kg Kuala Bera
Kg Jelam
Kg Batu Papan

S Tekam
S Jenka
S Krau
S PAHANG
S Tekal Kechil
S Semantan
S Belengu
S Bera
S Chat

LEGEND

Road
Railway
Village
River
Spot height
Existing development
Forest Reserve

Scale 1 inch to 4 Miles

0 1 2 3 4 5 10

utilisation must be accepted than that obtainable by commercial estates and from this it follows that a lower return to capital will result. It is in this sense that the objective of land settlement as such constitutes a limiting requirement.

Overall Planning Criteria

Certain overall economic and social criteria which have been used in deciding the approach to Triangle development are as follows:

1. Efficient use should be made of management, especially those levels or categories of management requiring great administrative or technical experience.
2. Efficient use should be made of capital, bearing in mind its high productivity in other uses.
3. Acquisition of capital and management resources should be obtained by encouraging private sector savings and investment wherever possible, by FLDA achieving a cash surplus from Jengka for reinvestment elsewhere, and by making the fullest use of existing management skills in both the public and private sectors.
4. The maximum number of employment opportunities should be provided, consistent with 1 and 2 above.
5. An adequate level of cash income should accrue to the settler, consistent with the ability to repay in total all investment by FLDA - at the borrowing rate of interest.

PARTICIPATION OF PRIVATE ENTERPRISE

Private enterprise has played the major role so far in the production of palm oil and rubber in Malaysia. Development of Jengka as a smallholder project effectively excludes private enterprise as a major contributor to production of the primary crops, either through investment or management; private investment in processing the primary crop products does not seem likely as the necessary control of factory input will not be feasible.

Private enterprise in Malaysia is particularly responsive to investment opportunities and it is clearly desirable that every possible advantage should be taken of this. In planning Jengka, therefore, the opportunities for private enterprise have been carefully considered and specific instances cited wherever possible. In general these opportunities are of three kinds: capital investment, construction and provision of services by contract, and specialised agency services.

Opportunities for direct private capital investment are limited for the reasons already stated. There is however one major opportunity in connexion with the proposed forest industry complex. Other opportunities in urban facilities and industries will develop with the Triangle's new towns.

In construction and other contract services there are numerous opportunities for participation. They include construction of forest industry plants, palm oil mills and rubber factories, and possibly

Figure 5

GENERALISED SOIL MAP

LEGEND

- Segamat Series
- Munchong series
- Durian series
- Batu Anam series
- Malacca series
- Tavy series
- Bungor series
- Serdang series
- Kedah series
- Jempol series
- Colluvium (Jempol)
- Colluvium (limestone)
- Colluvium (miscellaneous)
- Telemong series
- River alluvium
- Akob series
- Limit of survey

JERANTUT

S. Tekam

S. PAHANG

S Jengka

MARAN

TEMERLOH

Scale 1 Inch to 4 Miles

0 1 2 3 4 5 10

roads. Contract service opportunities include logging, land clearance and preparation, planting, and haulage of primary crop products into processing plants and of processed material to markets, ports of shipment or storage sites.

In respect of specialised agency services it is recommended that FLDA seek contractual or fee-based arrangements for supply of oil palm planting material and for scientific and market research data.

THE REGIONAL APPROACH

The Jengka Triangle is the first of what may become a series of major land development projects. It calls for planned development - the orderly transition from virgin forest to productive settled land - on a scale not so far undertaken in West Malaysia. Such development requires an approach quite different from that by which land settlement has taken place so far - mainly as fringe development along rivers or existing roads or as relatively small compact units related to existing roads, towns, and public services. Settlement of Jengka calls for a regional plan.

The Triangle is framed or contained by topographic features and existing settlement (Figure 7). With the exception of a part of the Tekam Forest Reserve which falls within the natural terrain features containing Jengka and which may later form part of a 'greater' Triangle scheme, steep hilly country to the north and east limits development. The Sungai Pahang and the riverine settlements along it preclude expansion to the south and west.

Figure 7
Regional Approach

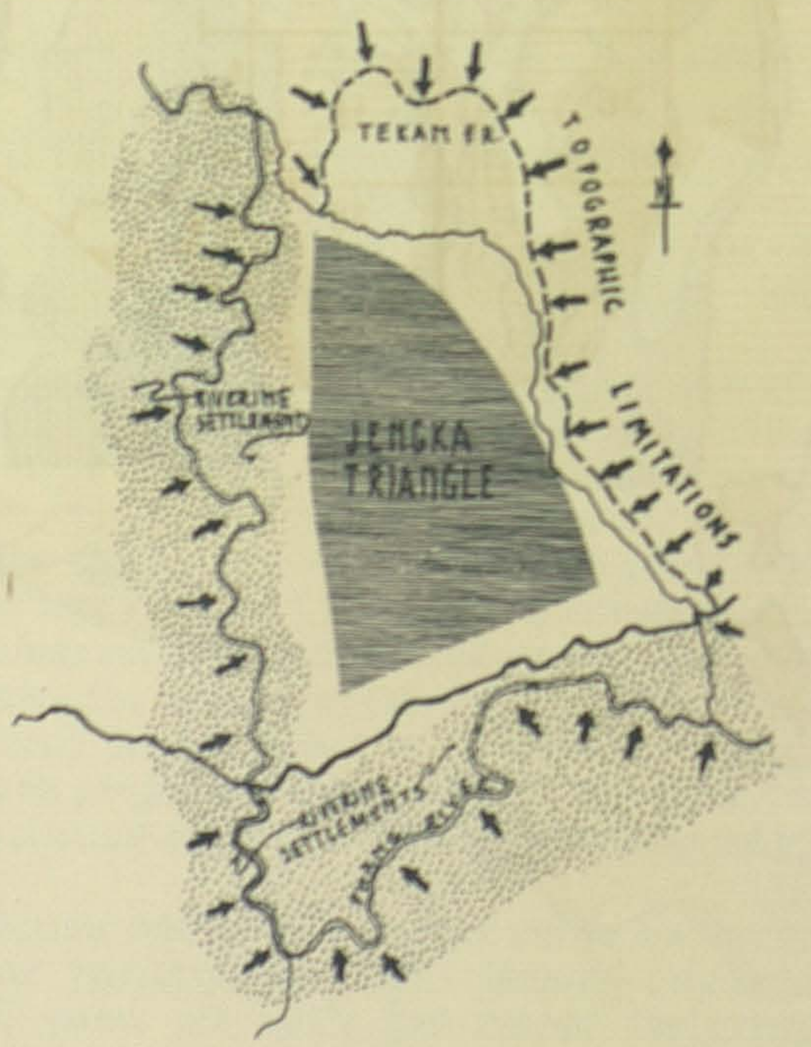


Figure 6

FOREST INVENTORY

Tekam Area

Jengka Forest Reserve

N.W. Quadrant

N.E. Quadrant

S.W. Quadrant

S.E. Quadrant

JERANTUT

TEMERLOH

MARAN

S. PAHANG

S. Tekam

S. Jengka

S. Jempol

LEGEND

- Logged over forest
- Swamp or wet areas carrying small trees
- Limestone outcrops
- Secondary forest
- Inventory block boundary
- Quadrant boundary
- Limit of Survey
- Inventory block number 9

Note:

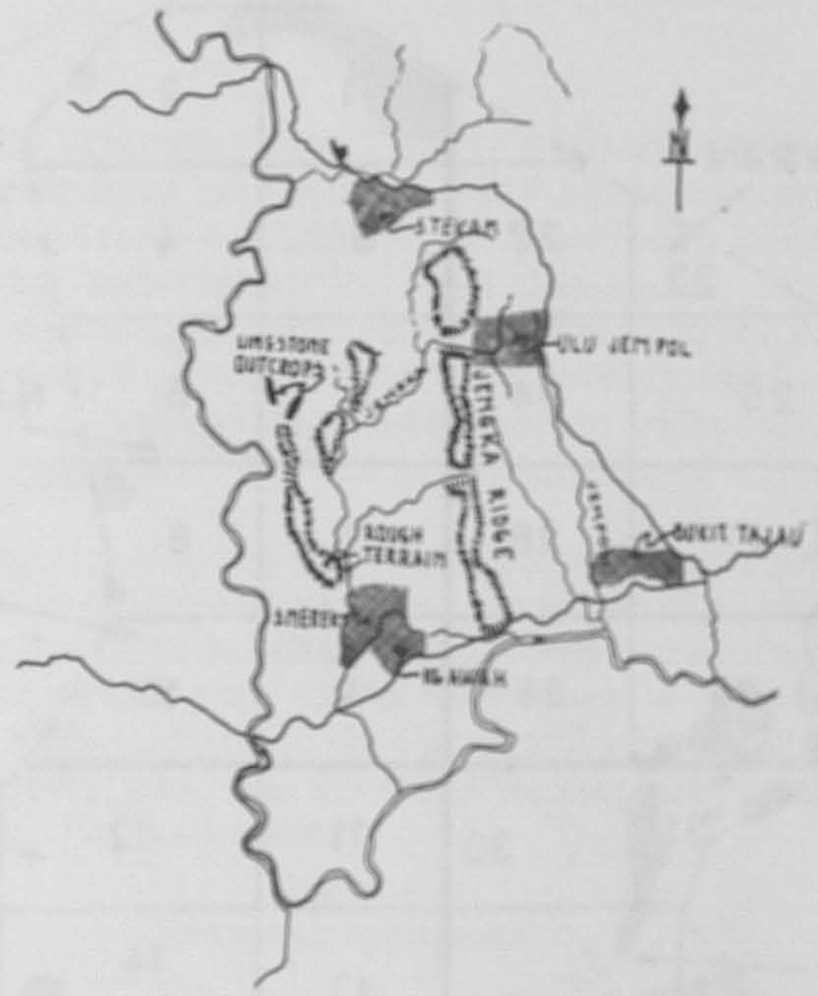
Excludes blocks 20 and 21 which lay outside the Inventory area in the Jengka Triangle

Scale 1 Inch to 4 Miles

0 1 2 3 4 5 10

Internally, the steep terrain of the north-south ridges, limestone outcrops, the major stream system and the existing FLDA schemes (which form part of the regional plan) all to some extent determine the character of the plan (Figure 8).

Figure 8
Regional Approach



The approach adopted for the regional planning of Jengka is as far as possible an extension of the natural established pattern of rural Malaysia with its small villages, towns, riverine road patterns and adaptability to terrain. All these typical local enviromental responses have been incorporated into the plan, although some modifications or changes have been considered advisable.

The physical separation of Jengka will undoubtedly give rise to the emergence of new rural towns. They can be planned for in a regional approach; they will require both effective internal and external road connections. The small agricultural villages and the riverine road system proposed for the Triangle will assist in the support of orderly town growth.

Regional development of this kind must take account of land use, population, services and economic needs. All must be integrated to form a balanced and workable plan. It is evident that the soundness of any specific proposal or policy recommendation depends in great measure on its relationship to other aspects of the regional plan. The proposed highway system both affects and is affected by the distribution of future patterns of land use. These are in turn determined mainly by such factors as soil quality, water supply, terrain and, in the case of

specific crops, by national policy and economic considerations. Through regional planning the interaction of factors affecting the future growth of the region can be assessed and the most favourable policy formulated.

The Master Plan proposed for Jengka provides a frame for the coordination of specific project activities and policy decisions. It is flexible and should be reviewed periodically as development proceeds. If conditions change or national objectives are modified the plan should be revised.

Figure 9

THE MASTER PLAN

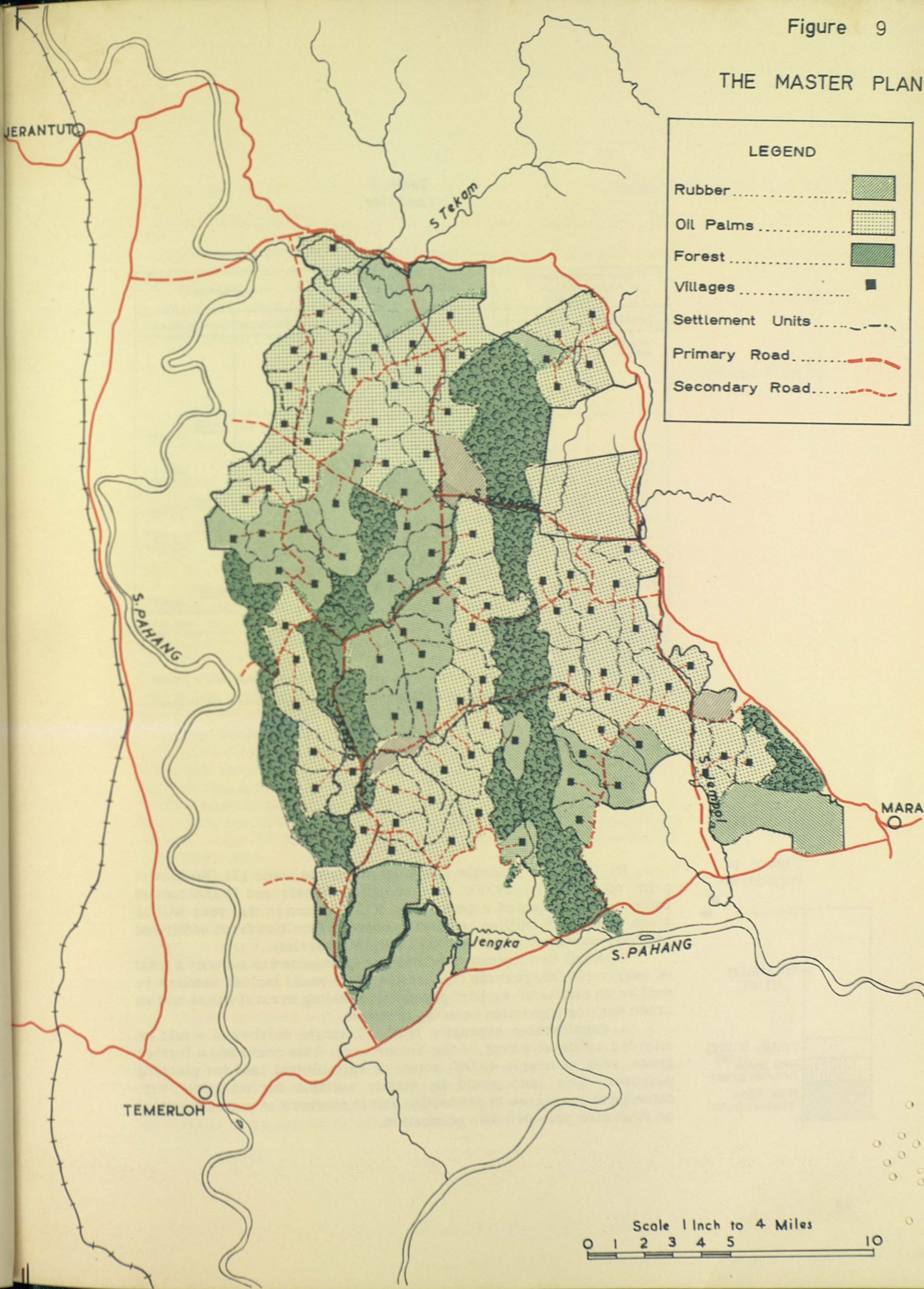
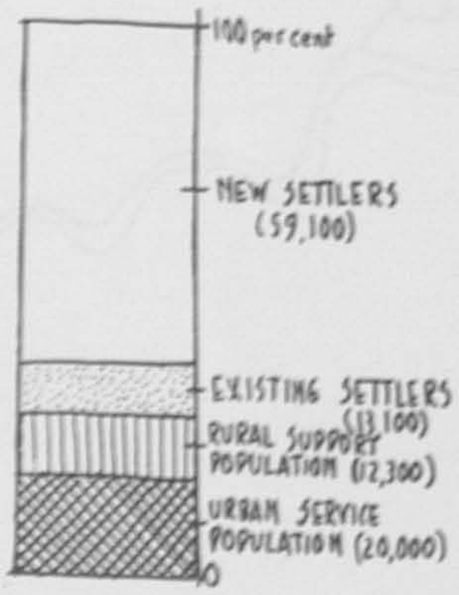


Table 1
Land Use

Land Recommended for Agricultural use (gross areas)		Land Planned for Development			Logging Areas		
Description	Area in Acres	Description		Area in Acres	Description	Area in Acres	
Oil Palm	83,000	Oil Palm		65,500			
Rubber	41,000	Rubber		27,500			
	124,000			93,000			
		Village Agricultural)		8,400 [1]			
		Roads)		4,800			
		Rural Triangle)			Rural		
		Areas Roads)		2,600	Areas	114,100	
		Schools and)					114,100
		Factories)		600			
		Unusable		4,700			
				21,100			
				114,100			114,100
		Towns		2,700	Towns	2,700	
				2,700			116,800 [2]
		Stream Protection		4,100	Streams	4,100	
				4,100			4,100 [3]
				120,900			120,900
		Forest					
		Agricultural land left under forest		3,100			
Forest	39,500	Forest land		39,500			
	39,500			42,600	Forest	42,600	
							42,600 [3]
Total New Land	163,500			163,500 [4]			163,500 [5]

1) Includes 6,000 acres available on houselots for secondary crops.
2) Logged 1966 - 1976.
3) Logged 1976 - 1978.
4) Excludes 25,500 acres of existing FLDA schemes, making a total area for development of 189,000 acres.
5) Excludes 5,200 acres pf logged area outside the Development Area, a total logged area of 168,700 acres.

Figure 10
Population



By 1985, the Triangle should be producing about 128,000 tons of palm oil annually, 29,000 tons of palm kernels and 28,000 tons of rubber. The projected export value of production in that year will be more than M$78 million, excluding over M$1 million from additional products consumed on or sold off settlers' houselots.

With full development the Triangle is expected to support a total of nearly 105,000 persons (Figure 10). This would include settlers as well as an estimated support population residing in rural areas and an urban service population residing in towns.

A considerable expansion of the Triangle northward would be afforded by development of the Tekam area. This could add a further gross area of nearly 40,000 acres of agricultural land for planning purposes. This land would be mainly suitable for oil palms, with consequent increases in production and in numbers of persons settled or otherwise provided with occupation.

COMPONENTS OF THE PLAN

The components of the Master Plan for the Jengka Triangle as set out here describe development as anticipated when the plan has been fully implemented (after 1977). The agricultural land use pattern is treated first since this determines the areas to be settled and affects the sizes and locations of individual projects and within them the settlement units and their smallholdings.

Agricultural Land Use

Three main uses are recommended: oil palm cultivation; rubber cultivation; and forest reserve (Figure 11).

About 124,000 acres of new land are considered suitable for agriculture. This is a gross potential acreage. The planning of actual production units necessitates adjustments to boundaries and setting aside of land for roads, villages, towns and other non-agricultural use. Allowance must also be made for small pockets of very steep land unsuitable for agriculture or poorly drained land which cannot economically be used. With all these deductions the actual area of primary crops is about 93,000 acres (Table 1).

Of the three main crops in West Malaysia whose agricultural and economic performance is sufficiently proven to justify consideration on a large scale, oil palms are clearly the most profitable. Rubber although less profitable than oil palms is to be preferred to rice which has very low economic priority. In any case the amount of land in Jengka which is well suited to rice production is small. Only very substantial changes in the actual or relative yields and prices of rubber and oil palms will alter this situation in the future.

The lands recommended for development with oil palms have been limited to those with soils of higher agricultural potential and with moderate slopes. It is considered that pending further experience of its performance on poorer soils oil palm cultivation on the land of lower potential should not be recommended. Reduced yields on such land could result in oil palm cultivation becoming less profitable than rubber. About 65,500 acres (net) of new land will be available for oil palm cultivation.

The remaining land suited to agriculture has soils of lower potential and steeper topography; it is recommended for planting of rubber. With its greater tolerance to adverse soil and topographical conditions, rubber cultivation on this poorer land is not expected to result in significant reductions in yield. About 27,500 acres (net) of new land will be available for rubber.

After forest clearance and detailed planning some of the small pockets of unsuitable land (total area about 4,700 acres) in agricultural areas may be found suitable for rice or fresh water fish cultivation. The cultivation of fresh water fish is expected to be very profitable on a small scale in areas with suitable topography and water supply.

A number of other crops have been considered as secondary crops in Jengka but the lack of sufficient research data, and doubtful market prospects, precludes their planting at present on a large scale. Bananas and Manila hemp appear to warrant further research and investigation,

especially for intercropping with rubber during the establishment years. The productive area of settlers' houselots is expected to be about 6,000 acres and a range of secondary crops could be established on them.

Land within the Triangle development area considered unsuitable for agriculture or required for the protection of catchments and river banks should be left uncleared; much of it could be held as forest reserve. This land covers about 46,700 acres and includes the three main ridges which run north-south through the Triangle where soils are poor and shallow and slopes are very steep and also a small area of steep land in the southeast corner adjoining the existing FLDA scheme at Bukit Tajau.

Projects

The size of the six recommended projects has been determined primarily by the need to make efficient use of management and by the topography of the Triangle. Each project is also of a sufficient size to be economically viable. The need to ensure that each project should be capable of independent implementation has resulted in all projects with one exception being self sufficient in processing facilities. Variation in the size of projects was accepted as allowing better utilisation of the likely variation in the calibre of managers. Existing FLDA schemes have been incorporated into the nearest projects for management and processing. Figure 12 and Table 2 show the position, size and salient features of each project.

Table 2
Projects of The Jengka Triangle

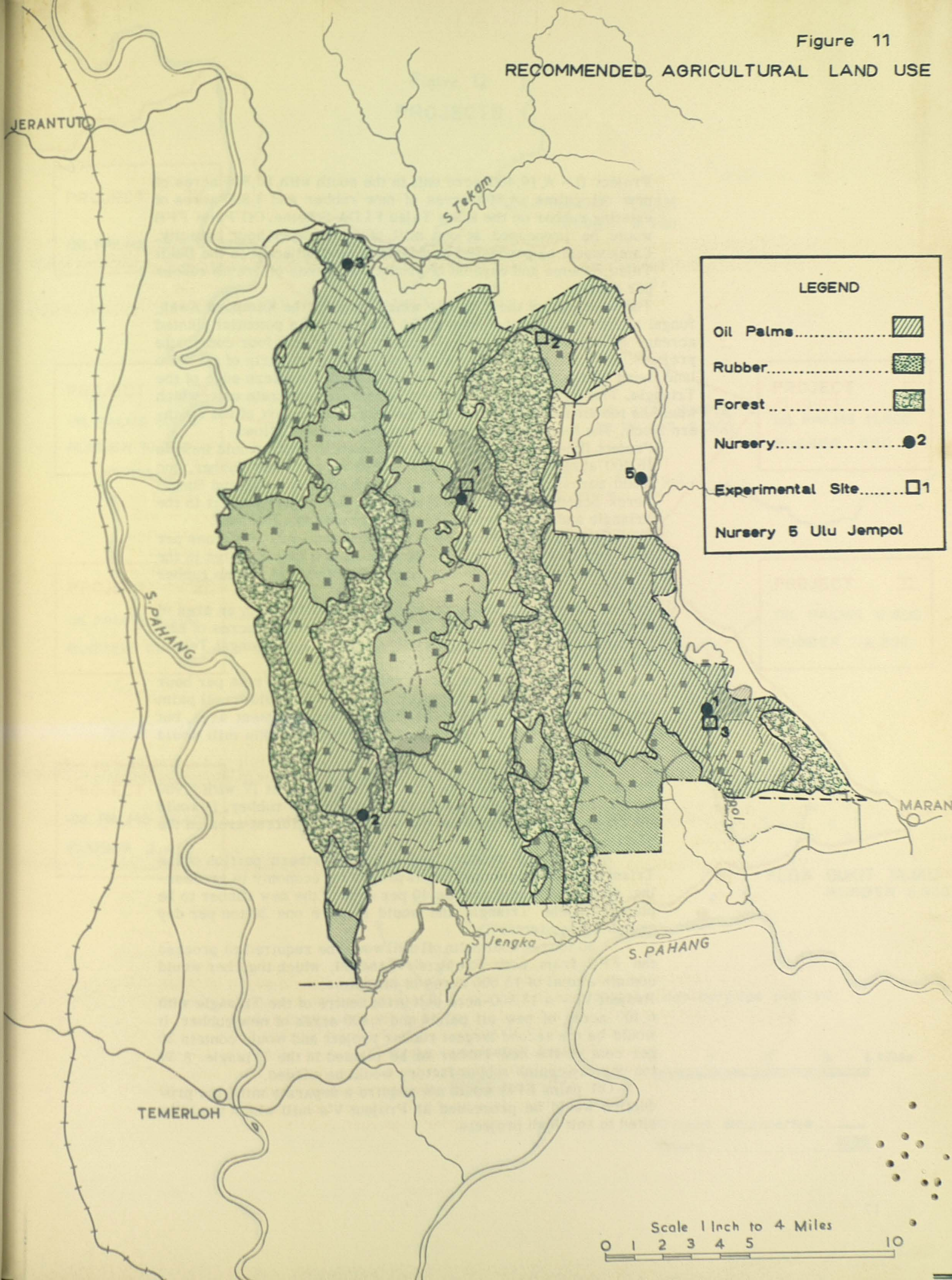
	Area of Primary Crop (acres)							
	Proposed			FLDA		Project	Palm Oil	Rubber
	Oil Palms	Rubber	Total	Oil Palms	Rubber	Totals	Mills	Factories
I	11,500	600	12,100	5,200	-	17,300	1	-
II	10,800	4,800	15,600	-	3,800	19,400	1	1
III	16,400	2,400	18,800	-	5,600	24,400	1	1
IV	13,500	-	13,500	-	3,300	16,800	1	-
V	6,900	10,300	17,200	-	-)	17,200)	1	1
VI	6,400	9,400	15,800	-	-	15,800)		1
	65,500	27,500	93,000			110,900		

The Jengka ridge separates the Triangle into a clearly defined east side and west side. The east side of the Triangle which includes the Ulu Jempol and Bukit Tajau FLDA Schemes has a potential planted acreage of 37,000 acres. This naturally divides itself into two projects.

Project I – A 17,300-acre unit in the north with 11,500 acres of new oil palms, 5,200 acres of existing oil palms on the Ulu Jempol Scheme, and 600 acres of new rubber. Oil palm fresh fruit bunches (FFB) from Project I woild be processed at a single mill of 40 tons FFB per hour capacity on the Ulu Jempol Scheme. The first stage of this mill is now under construction by FLDA.

Figure 11

RECOMMENDED AGRICULTURAL LAND USE



Project II - A 19,400-acre unit in the south with 10,800 acres of new oil palms, 4,800 acres of new rubber and 3,800 acres of existing rubber on the Bukit Tajau FLDA Scheme. Oil Palm FFB would be processed at one mill of 30 tons per hour capacity. Latex would be processed at a factory sited adjacent to the Bukit Tajau Scheme and capable of producing 30 tons of crumb rubber per day.

The west side of the Triangle which includes the Kampong Awah, Sungai Nerek, and Sungai Tekam FLDA Schemes has a potential planted acreage of about 74,000 acres. It can be divided into four composite projects, with the exception of a narrow 7,000 acres strip of oil palm land lying between two smaller ridges on the western edge of the Triangle. This strip can be considered either as a separate unit, which would be too small for efficient management, or as a part of the southern block. The four projects on the west side are as follows:

Project III - A 24,400-acre unit on the south which would include 16,400 acres of new oil palms, 2,400 acres of new rubber, and 5,600 acres of existing rubber on the Kampong Awah and Sungai Nerek Schemes. This project would be the largest project in the Triangle and would approach the maximum desirable size.

Oil palm FFB would be processed in one mill of 40 tons per hour capacity; latex would be processed at a factory sited in the Sungai Nerek Scheme having a capacity of 36 tons of crumb rubber per day.

Project IV - A 16,800-acre unit in the northwest in an area of predominantly oil palm land. It would include 13,500 acres of new oil palms, and 3,300 acres of existing rubber in the Sungai Tekam Scheme.

Project IV would require a palm oil mill of 30 tons per hour capacity for its own output. If future smallholder oil palm production on land outside the Triangle development area, but adjacent to Project IV were also to be processed, this mill would have to be expanded.

Project V - A 17,200-acre unit south of Project IV with 6,900 acres of new oil palms and 10,300 acres of new rubber. It would lie between a low ridge on the west and the forest area on the east.

All the new rubber land in the northern portion of the Triangle would be grouped in this project for economy in processing; Project V would contain 40 per cent of the new rubber to be planted in the Triangle and would require one 30 ton per day crumb rubber factory.

A 30 ton per hour palm oil mill would be required to process the FFB from both Projects V and VI, which together would contain a total of 13,300 acres of oil palms.

Project VI - A 15,800-acre unit in the centre of the Triangle with 6,400 acres of new oil palms and 9,400 acres of new rubber. It would be the second largest rubber project and would contain 30 per cent of the new rubber to be planted in the Triangle. A 30 ton per day crumb rubber factory would be needed.

Oil palm FFB would not require a separate mill; the production would be processed at Project V's mill which would be sited to suit both projects.

Figure 12

PROJECTS

PROJECT IV

OIL PALMS 13,500

PROJECT V

OIL PALMS 6,900

RUBBER 10,300

PROJECT VI

OIL PALMS 6,400

RUBBER 9,400

PROJECT III

OIL PALMS 16,400

RUBBER 2,400

F.L.D.A SUNGAI TEKAM

RUBBER 3,300

F.L.D.A ULU JEMPOL

OIL PALMS 5,200

PROJECT I

OIL PALMS 11,500

RUBBER 600

PROJECT II

OIL PALMS 10,800

RUBBER 4,800

F.L.D.A BUKIT TAJAU

RUBBER 3,800

F.L.D.A KAMPONG AWAH SUNGAI NEREK

RUBBER 5,600

Figures net acreage planted

0 1 2 3 4 Miles

Project Boundaries.....

Towns.....

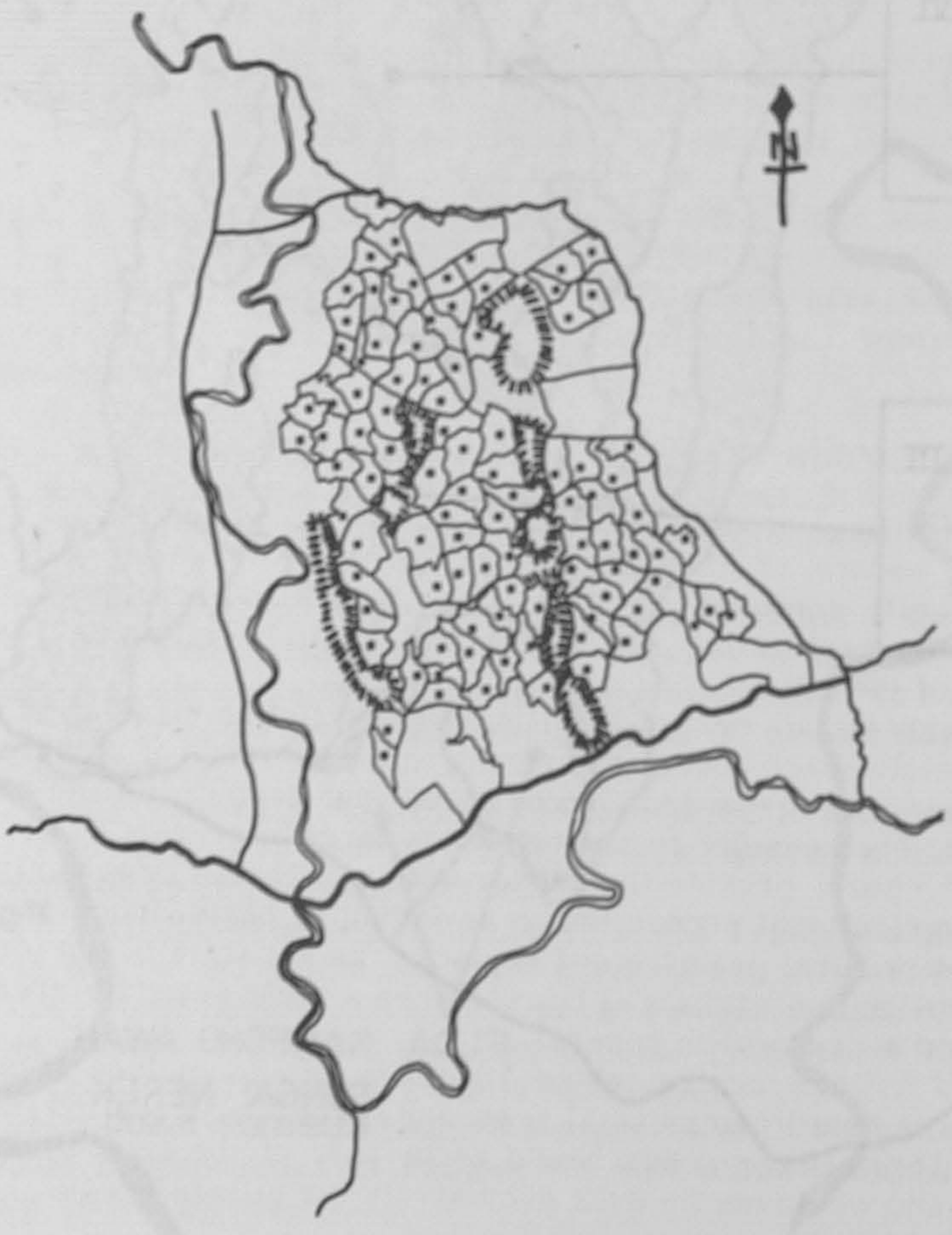
Settlement Units

Each of the Projects has been further subdivided into settlement units. These are the basic units for social and community development within the Triangle. Each comprises an area of main crop and a centrally sited village.

The type and size of the settlement unit has been determined by a number of factors, including the need to group the settler population into communities which will facilitate and sustain social development and welfare. Location and size of settlement units has been determined by topography to provide natural and easily recognisable boundaries and by the need for maximum management efficiency in linking the agricultural communities to the management structure of each project.

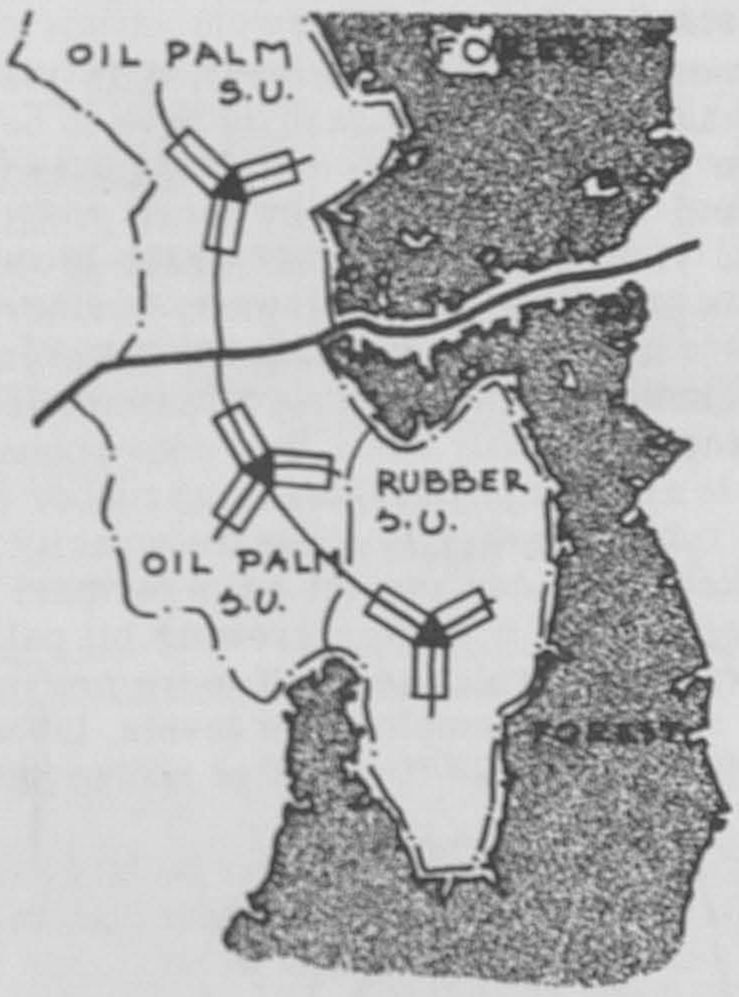
New land in the six projects is divided into 97 settlement units each covering some 1,150 - 1,200 acres of gross area (Figure 13). The relatively small settlement units could be easily adapted to changes in soil conditions or terrain, and therefore agricultural land use, over relatively small distances (Figure 14). They would also afford considerable flexibility in the assignment of management staff; the numbers of units allocated to individual managers could be varied in accordance with their capabilities.

Figure 13
Settlement Unit Plan



The village size proposed follows closely the layout and pattern found at present throughout rural West Malaysia. It is planned to accomodate 90 - 100 settler families and a small rural support population of FLDA staff, teachers, and others who would provide the services necessary to village life. The average total population of a village would be about 800 people.

Figure 14
Land Use Variation Between Settlement Units



The village would cover some 85 - 90 acres and should be sited near the centre of the agricultural area it serves (Figure 15). If geometrically confined, the settlement unit would be about 1.3 miles square; any part of the settlement unit would be within easy walking distance of the village.

Figure 15

Nearly 90 per cent of the village area would be made up of houses and houselots, each houselot covering three quarters of an acre. Here the settler can grow fruit trees, food and cash crops and can keep livestock. The houselot recommended is large by present FLDA standards and should provide the settler with substantial opportunities for further agricultural production on an intensive basis. It conforms well with present rural practice and replaces the separate dusun (orchard) areas provided on earlier FLDA schemes - these separate areas have not proved successful in general.

The village centre, about 10 acres, would include community buildings, a small commercial area, and space for recreation facilities (Figure 16). Village roads would form part of the agricultural road network and would not be built exclusively for village needs.

The Smallholding

The success of any land settlement scheme depends ultimately on the settler himself. He is the farmer who must actually grow the crops and his well-being is therefore fundamental.

This report firmly recommends that the settler should in fact be a smallholder; implying that he grows crops on a recognisable piece of land to which he eventually gains title. The social importance of land ownership is very great and it is recommended that settlement of smallholders be accepted as a basic condition. This does not conflict with agronomic, economic, or managerial efficiency for the primary crops under consideration.

The next most important consideration is that of holding size, and it is here that a number of factors have to be evaluated and an optimum solution proposed. Of the two primary crops, oil palm is at present prices and yields considerably more profitable than rubber. Future price and yield trends which have been projected suggest that this difference is likely to be maintained. Furthermore, the labour requirements for the two crops are not only different in kind but also in total amount; growing and harvesting oil palms needs less labour on both an annual and on a daily basis than does rubber. Harvesting oil palms, however, is a harder physical task than rubber tapping, a feature which allows the rubber grower to use spare capacity within his family to a greater extent than can the oil palm farmer. Nevertheless the disparity is considerable; a settler growing oil palms can manage a larger acreage of a crop which is itself more profitable than rubber. On the basis of reasonable employment levels, labour input requirements suggest holdings with 8 - 10 acres of rubber and 10 - 12 acres of oil palms.

Any holding size recommended must be large enough to produce an income (the farm gross margin) sufficient both to allow repayment in full of FLDA's costs with interest at an assumed rate of seven per cent and to provide the settler with an adequate cash income. Comparative studies indicated that these conditions are met by holding sizes of 10 acres for rubber and 8 - 9 acres for oil palm. Smaller holdings than these have not been considered, even though there is a case to be made for maximum density settlement in the present context of rural underemployment. With smaller holdings, either loan repayment would have to be sacrificed or the settlers' cash incomes brought below what is considered to be a reasonable level. Settlement on initially smaller holdings, with additional land reserved for later distribution, is considered neither practicable nor economically justifiable.

The levels of income tested in this study are set out in Table 3. Income IV is that selected as the most appropriate.

These factors taken together with the important social concept of equality in land holding, have led to the final recommendation that holdings for both oil palm and rubber should be of 10 acres.

Differences in labour input - and therefore in return to labour - remain and for two such different crops cannot be eliminated. Because oil palm is generally grown on better land however, a differential rent is proposed which in effect reduces the oil palm settlers' cash income to one closely comparable to that of settlers growing rubber and at the same time generates a surplus with FLDA. Such a surplus can be used for financing future developments or, should price and cost trends

CROPLAND

PARKING

SERVICE ROAD

F.L.D.A. STORES & OFFICE

COMMUNITY CENTRE

MARKET AREA & SHEDS

CO-OP SHOP

BUS STATION

COMMUNITY RESERVE

SHOPHOUSES

PARKING

SURAU

PADANG

F.L.D.A.

SETTLER

HEADMASTER

TEACHERS

F.L.D.A.

SETTLER

SETTLER

justify it, the extra income from the larger oil palm holdings accruing to FLDA through the differential rental rate could be redistributed to both oil palm and rubber settlers in the form of higher cash incomes. An important element of flexibility is thereby introduced.

Table 3
Possible Settlers' Incomes [1]
(M$ per year)

	Settler's cash income (During Repayment Period)	Income from houselot	Settler's income
Income I	2,400 throughout repayment period	100-350	2500-2750
Income II	1,200 rising to 3,600	100-350	1300-3950
Income III	1,200 rising to 2,400	100-350	1300-2750
Income IV	1,200 rising to 1,800	100-350	1300-2150

1) Cash income from end of first year of oil palm harvesting and rubber tapping to the end of repayment period, 25 years after planting.

Towns

The Jengka Triangle will develop as an integrated group of small villages with a rural population of approximately 85,000 persons, including the estimated population of both the proposed settlement units (72,000) and the existing FLDA schemes (13,000). A rural population of this size will generate needs for specialised administrative medical, educational, commercial and industrial services. These services are partially interdependent and operate more efficiently and effectively if placed together in conveniently located urban centres.

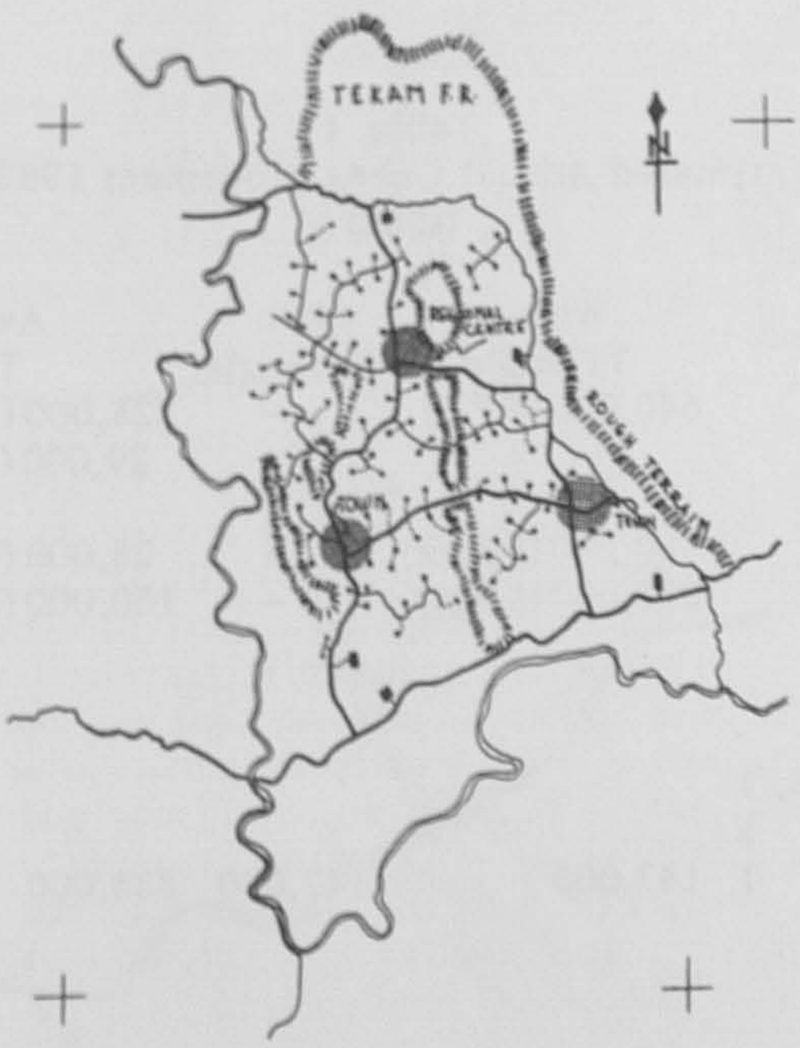
The present urban facilities near Jengka are inadequate to provide for the future needs of the Triangle. The four existing major settlements in the area will have only a partial beneficial effect on the development of Jengka because of their location with respect to the body of the Triangle (Figure 17). The existing centres at Jerantut, Kuala Krau, Temerloh and Maran are hampered by lack of connection with and distance to the main area of the Jengka Triangle.

For Jengka three new towns are proposed, patterned on existing Malaysian rural towns. A regional centre and two smaller towns have been sited to provide the rural popupation with urban services (Figure 18). These towns would embrace all the activities now seen in rural Malaysian towns and would be capable of free growth and development. Eventually these new towns should become an integral part of the rural-urban environment and the national urban pattern.

The regional centre housing FLDA Triangle headquarters staff would have a population of about 12,000 people including 4,000 workers and dependents associated with the timber industry and with a palm oil mill and a rubber processing factory. The two smaller towns would have populations of about 4,000 people each.

Figure 17
Existing Towns

Figure 18
Proposed Towns



Transportation Systems

The Triangle's transportation was planned to make best use of national resources and, subject to this, to involve where possible private sector capital and expertise in development of the Triangle thus avoiding the need for FLDA to become involved in transport owner-operation.

The seasonal demand for transport of latex and oil palm fresh fruit bunches within the Triangle provides ample opportunities for seasonal employment of transport equipment in other commodities both within the Triangle and elsewhere. In view of this, a system using contract hired 5-ton payload lorries is recommended for internal transport for agricultural goods. The transport of logs between forest working areas and the proposed timber industry would be by means of specialized 100-ton gross weight log haul vehicles.

In the movement of oil palm products and rubber to Port Swettenham transport by 12.5-ton payload tank lorries and 7.5-ton payload conventional lorries appears preferable to other systems, which involve rail, or smaller payload lorries. A system of large tankers and lorries operated by contractors is therefore recommended. If contractors are unwilling to operate large lorries on this scale, an attempt should be made to negotiate special rates with the railway. The use of small (5-ton) lorries over the full distance from Jengka to Port Swettenham is not recommended. Highway transportation is also preferred for processed timber and log movements away from the Triangle.

The annual volume of goods expected to be moved within the Triangle is estimated to rise to about 1.1 million tons by 1985, and the annual volume moving to and from the Triangle to about 0.5 million tons (Table 4).

Table 4
Estimated Annual Goods Movement 1985
(tons)

	Within Triangle	Into Triangle	Away from Triangle
Oil Palm Products	640,000 (FFB)	-	128,000 (Palm Oil) 29,000 (Palm Kernels)
Rubber	80,000 (Latex)	-	28,000 (Crumb Rubber)
Timber	255,000 (Logs)	-	150,000 (Logs and Processed Timber)
Consumer goods, food, fuel and fertilizer	147,000	147,000	335,000

Figure 19

PROPOSED ROAD PLAN

JERANTUT

S. Tekam

S. PAHANG

S. Jempol

MARAN

S. Jengka

S. PAHANG

TEMERLOH

LEGEND

Existing Roads ——————

Proposed Primary Roads – – – –

Proposed Secondary Roads ------

Scale 1 Inch to 4 Miles

0 1 2 3 4 5 10

Internal Road Network

The internal road network has been planned to provide adequate facilities for the movement of all goods within and out of Jengka by road. Primary roads have been planned as main transport arteries between the towns and the main centres of activity and to provide effective links with the existing outside road network. Secondary roads have been planned to provide good communication between the villages, the processing factories and the primary road system. With careful planning the secondary road system can combine a basic agricultural collection function with village service and a road system built solely for village access and internal circulation can largely be avoided.

Within each settlement unit a system of tertiary and improved tertiary roads provides access between the villages and the primary crop areas. Segments of the tertiary road system would also serve as village frontage roads; this system also would provide a combined agricultural and village service.

Primary and Secondary Roads - The primary and secondary road systems are shown in Figure 19. The primary road network includes about 64 miles of highway built to Federal trunk road standards. It comprises a main north-south artery along the valley of the Sungai Jengka with a link in the northwest across the Pahang, an eastern section following the valley of the Sungai Jempol and providing a main artery east of the Jengka ridge, and an east-west connection between the two.

The secondary road network comprises 202 miles of rural standard road of which 121 miles would be located within settlement units and 81 miles would be aligned to connect the settlement units with the primary roads and the processing factories. Short secondary road segments would be built to connect the Triangle's internal road system with existing settlements along the Sungai Pahang.

Tertiary Roads - The tertiary, or harvesting road system is based on the settlement unit. The layout and standard was determined by the need to provide good lorry access to the areas of oil palm and to reduce the carrying distance of the fresh fruit bunches to six chains. Thus each oil palm settlement unit would require about 12 miles of tertiary road constructed with or without laterite base as the soil and the topography require. Fewer tertiary roads would be needed in rubber settlement units and the standard required would be somewhat lower. A typical rubber settlement unit would have only seven miles of tertiary road. The Triangle as a whole would have about 1,026 miles of tertiary roads.

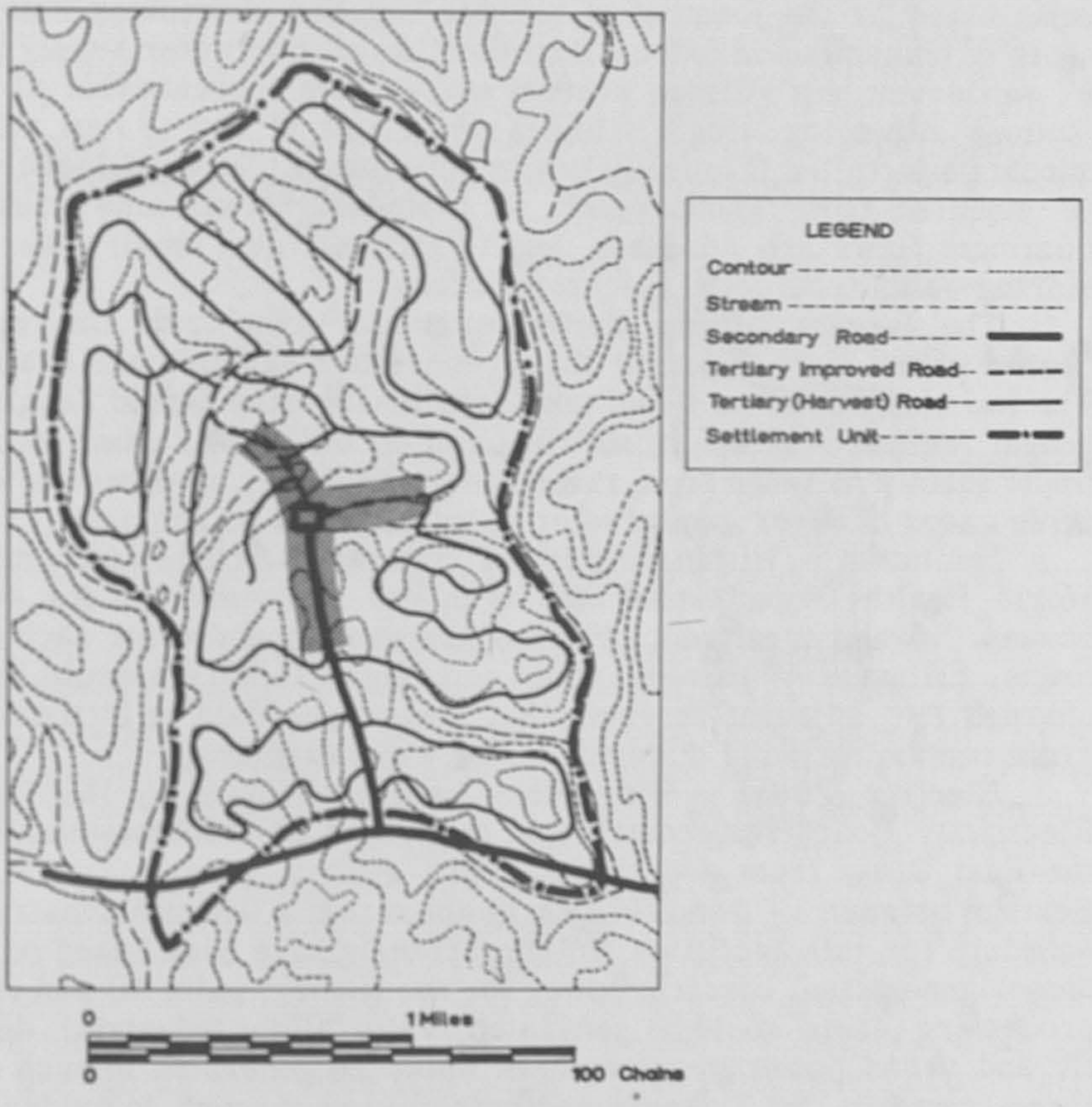
It is recommended that tertiary roads in and near the villages be built to a somewhat higher standard since they would bear a larger volume of traffic. About 94 miles of such improved tertiary road would be constructed.

The relationship between tertiary and secondary roads within typical settlement units is illustrated in Figure 20.

Coordination With Logging Roads - Logging would precede agricultural development and the heavy logging roads constructed for the modern forest operations recommended could be used for other purposes on completion of log hauling. To avoid construction of a duplicating road system, the layout of the Triangle's permanent internal roads has been co-ordinated with that of the logging roads. Main,

secondary and spur logging roads would be built initially on more than half of the Triangle's road system. On completion of logging, relatively minor modification of alignment, construction of permanent drainage, and other improvements would be undertaken to bring logging roads up to required standards.

Figure 20
Settlement Unit Roads



External Roads

External roads which connect the Triangle with Port Swettenham, Kuala Lumpur, and other main destinations are of adequate standard and capacity to serve in the initial development of the Triangle. Improvements will be needed to accommodate expected future goods volumes moving to and from the Triangle as well as anticipated increases in other traffic. These include the improvement of the Kuala Lumpur-Bentong section of National Route II and the replacement of the temporary one-lane bridge at Temerloh.

Port Facilities

The use of Port Swettenham is assumed for all of Jengka's import and export traffic. It is anticipated that planned improvements at the port will provide adequate capacity to handle all Triangle commodities except palm oil. A bulking facility will be needed at Port Swettenham to handle palm oil from Jengka and from other FLDA development areas.

Public Utilities

Public utilities in Jengka have been planned to provide levels of service in line with current policy on present and future standards (Figure 21). The planning of utilities has taken account of rises in rural and urban populations that are expected to take place after full agricultural production is reached.

Water Supply - Systems of rural and urban water supply were determined by the location of suitable supplies of drinking water and costs of transmission to the villages and towns. For water supply to the 97 settlement unit villages present survey data suggests that 47 pump stations supplying single villages or groups of two to four villages should be installed (Figure 21). It is anticipated that 40 villages would be supplied from groundwater, 40 from nearby streams where the minimum flows are adequate, and 17 villages from small reserviors storing water from local catchment areas.

The largest demand for water would come from the regional centre where it is expected that groundwater supplies are available. The two smaller towns would take supplies from the Sungai Jengka and Sungai Jempol. Water supplies for palm oil mills and rubber factories would mainly be taken from rivers near which they have been sited. In three cases however groundwater supplies would be required.

Sanitation - Within settlement units, pit latrines conforming to World Health Organisation Standards are recommended for settler houses. Sewage treatment systems are recommended for each of the towns. Effluents of palm oil mills and rubber factories would be discharged into adjacent streams, but measures would be introduced to avoid contamination of domestic water supply intakes.

Electric Power - Proposals have been made by the National Electricity Board for construction of a 132-KVA transmission line to the East Coast from a proposed hydro-electric generating station at Bentong between 1970 and 1975. In the absence of a definite construction schedule for this facilities for the Triangle have been based on local diesel generation. Electric power for the timber, palm oil and rubber processing plants would be generated on site. Minor industrial, domestic and urban power requirements would be generated in each of the three towns in the Triangle and transmitted through individual distribution networks (Figure 21).

In the rural areas electric power is not recommended in the initial stages of development. As incomes increase and demand for domestic power becomes greater, consideration should be given to providing local power supply for each settlement.

Telecommunications - The basic telecommunications service network would provide a system of nearly 250 telephones among the agricultural settlements and over 350 telephones in the towns and at industrial plants. This is based on each settlement having one public call box for settlers use and a separate line to the FLDA office. In the towns provision would be made for telephone services to FLDA and other government agencies, industry, commerce and residential areas (Figure 21).

Telecommunications connections to exterior points were assumed to be made by land lines; provision is made in the plan for a future VHF connection.

Figure 21

PUBLIC UTILITIES & SCHOOLS

LEGEND

WATER SUPPLY

- Existing Source
- Proposed Source
- Groundwater
- Stream

TELECOMMUNICATIONS

- Existing Exchange
- Proposed group centre exchange
- Proposed dependent exchange

ELECTRIC POWER

- Diesel generator station (towns only)

SCHOOLS

- Primary
- Secondary

Note: Also an upper Secondary in each town and Teacher Training College in the Regional Centre.

JERANTUT

S. Tekam

S. PAHANG

S. Jengka

S. Lembing

MARAN

S. PAHANG

TEMERLOH

Scale 1 Inch to 4 Miles

0 1 2 3 4 5 10

Social and Other Services

Health Services - The health service facilities in Jengka would comprise two rural health units each serving approximately 50,000 people. Facilities would include two main health centres, eight sub-centres, and 26 midwife clinics (Figure 22). A hospital incorporating one of the main health centres would be located in the regional centre.

Education - Because improved education is essential to national development, facilities in Jengka have been planned to provide education at all stages from primary level to teacher training. The plan for the distribution of primary, secondary and other schools is shown in Figure 21; it includes existing and proposed schools in FLDA schemes. Approximately 25 per cent of the rural population is expected to be of primary school age; one primary school of about 12 classrooms is proposed for every two settlement units. There would be 42 primary schools sited in settlement units and FLDA villages and 14 in the towns. One secondary school to accommodate 70 per cent of the primary school leavers would be sited to serve every six settlement units; 13 would be in the rural areas and eight in the towns. Three upper secondary schools, one in each town, and one teacher's training school (in the regional centre) are also proposed. This programme would require about 800 primary school teachers, nearly 700 secondary school teachers and about 90 teachers in higher grade schools.

Other Services - In accordance with official policy it is proposed that Jengka be made a new police district divided into six sections (Figure 22). The headquarters and one section would be based in the regional centre. Four other police stations would be established in addition to that now located at Kampong Awah.

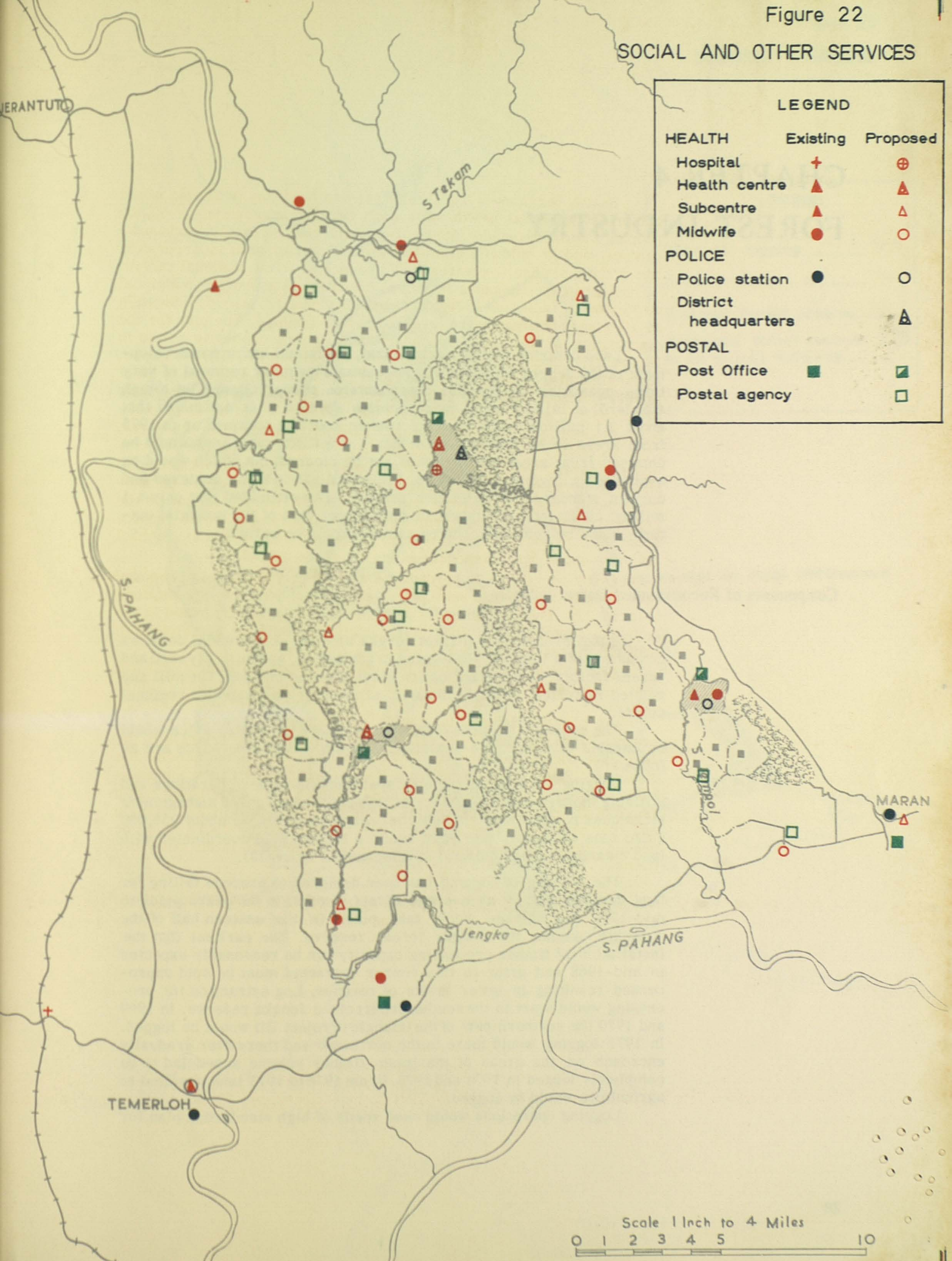
One Postal Agency would be established per settlement unit and one post office would be established in each of the three towns (Figure 22).

At present Jengka is mainly administered from two district centres, Jerantut and Temerloh. A small part of the Triangle in the southeast corner falls in the Pekan District. It is recommended that Jengka be constituted as a separate district for administrative purposes with District Offices in the regional centre. It is anticipated that a range of government departments would be established in the Triangle and that ultimately five standard government office blocks would be needed, three in the regional centre, and one each in the other two towns.

Figure 22

SOCIAL AND OTHER SERVICES

LEGEND		
HEALTH	Existing	Proposed
Hospital	+	⊕
Health centre	▲	▲
Subcentre	▲	△
Midwife	●	○
POLICE		
Police station	●	○
District headquarters		◬
POSTAL		
Post Office	■	◪
Postal agency		□



CHAPTER 4
FOREST INDUSTRY

Land clearing for the agricultural, industrial and urban development of the Jengka Triangle will necessitate the prior removal of very large quantities of valuable merchantable timber. Based on a high standard of utilisation of merchantable species it is estimated that about 2.1 million cubic tons* of timber could be obtained up to 1975 from areas to be cleared; a further 1.0 million cubic tons would be obtained from areas which would not be cleared, but which would be available for logging in 1976 - 78. If high utilisation is not achieved and current standards of utilisation prevail, it is estimated that only 1.1 million cubic tons of timber, or only 35 per cent of the potential outturn, would be removed. The remainder would be burned.

Components of Recommended Forest Industry

To log, process and market Jengka's timber an industrial complex consisting of a large-scale logging organisation, sawmill, plywood and veneer factory, and prefabrication plant is recommended. The mill and related factories would be located adjacent to the proposed regional centre.

The essential features of an integrated forest industry which would be capable of productive exploitation of the valuable resource are as follows:

Logging - A logging system capable of all weather operations and utilising modern methods, heavy equipment, and advanced management techniques is necessary. It would be organised to remove about 255,000 cubic tons of timber per year under a logging plan coordinated with land clearing for agricultural development (Figure 23).

The phasing of logging has been designed to precede felling for land development by an average of six months. In the years prior to mid-1968 log salvage would take place in the eastern half of the Triangle outside the Jengka forest reserve. The earliest that the installation of timber processing capacity can be reasonably expected is mid-1968 and prior to this timber extracted must be sold unprocessed resulting in lower levels of revenue. Log extraction for processing would start in the southeast part of the Jengka reserve. In 1969 and 1970 the southern part of the triangle (Project III) would be logged. In 1971 logging would move to the northwest and thereafter gradually encroach on the areas of maximum timber volume scheduled to be completely logged in 1974 and 1975. From 1976 to 1978 land unsuited to agriculture would be logged.

Logging operations would need roads of high standard; a plan for

Figure 23

LOGGING PHASING

LEGEND

Year of logging..... 1971

Project areas.....

Existing forest reserve... —·—

Proposed forest reserve to be logged 1976-78.....

Log salvage by local contractors

1971 1971 1972 1966-68 1973 1970 1971 1972 1972 1968 1973 1974 1973 1973 1966-67 1974 1973 1970 1968 1972 1975 1968 1970 1970 1969 1969 1969 1969 1970 1975 1971

S. PAHANG

S Tekam

S Jengka

S. PAHANG

MARAN

TEMERLOH

Scale 1 Inch to 4 Miles

0 1 2 3 4 5 10

logging roads has been coordinated with the permanent road system required, to avoid duplication as far as practicable. The savings to the Triangle development through the advance construction of many roads by the forest industry are estimated at about M$7,000,000. This potential saving has not been included in the economic analyses for Jengka.

Logs removed would be distributed as follows:

	Annual Tons (logs)
Sawmill	140,000
Plywood and Veneer Factory	65,000
Log Sales	50,000
	255,000

The logging operation would require a capital investment of M$15,900,000; would generate total sales of M$138,800,000 and have an average annual return on investment of 17 per cent.

Sawmill - A modern sawmill located in the centre of the Triangle adjacent to the proposed regional centre would be provided. It could begin operation by mid-1968 if necessary approvals are forthcoming. It would require a capital investment of M$7,500,000; would generate total sales of M$120,600,000, and have an estimated average annual return on investment of 13 per cent.

Plywood and Veneer Factory - As part of the integrated forest industry, a plywood and veneer factory capable of manufacturing annually, 100,000,000 square feet (3/16" basis) of products would generate total sales of M$115,500,000 and have an average annual return on investment of 26 per cent.

Prefabrication Plant - The recommended prefabrication plant would consume 10,000 cubic tons annually of sawn timber and produce the equivalent of 2,500 settler houses per year. It is estimated that up to 1,500 settler houses per year or their equivalent in other structures would be needed for the Triangle development and that sales opportunities exist for an additional 1,000 houses or their equivalent outside the Triangle, including export sales. The estimated cost of producing settlers' houses in the Triangle at this plant is M$1,130 per house, including transportation and erection.

The prefabrication plant would require a capital investment of M$1,500,000; would make total sales of M$35,300,000, and would have an average return on investment of 20 per cent.

The Industry as a Whole

For the industry as a whole, forest product sales are estimated to total about M$410,000,000. After deducting transfer payments within the industry, such as the sale of logs to the sawmill and of sawn timber to the prefabrication plant, net sales of the industry would be about M$297 million. Total profits after taxes are estimated to total M$73,000,000. Estimated cash flow from operations of the forest industry as a whole would return the total investment by 1972, the fifth year of operation.

The recommended forest industry can be justified on the basis of

the Jengka Triangle's timber supply alone. The addition of the timber in that part of the Tekam Forest Reserve inventoried as part of this study would add to the financial attractiveness of the project, and this is strongly recommended. Even more timber near the Triangle should if possible be set aside for the new industry; unlogged areas in and adjacent to the Berkelah Forest Reserve would be well suited to this purpose.

Implementation

A substantial requirement for capable, technically qualified management of the industry will arise. The skills needed for this are not now generally available in Malaysia as the Jengka forest industrial complex would be the first of its kind here. In addition, considerable capital investment will be required and the presence of a large captive market overseas for as much as possible of the output would be of great use. These factors suggest that a practicable means of implementing the recommended forest industry plan would be to establish a joint venture between a Malaysian partner and a company from the United States, Canada, the Philippines, Japan or Australia that can supply the requisite management skills and experience, the capital, and the captive markets (or sufficient marketing skill to obviate the need for captive overseas markets).

Time schedules have been prepared for the planning and construction of the forest industry complex (Figure 24). The recommended schedule followed in this report extends from approval of the forest industry plan (January - February 1967) to the start-up of operations in May 1968, a period of 17 months. This is a finely timed schedule and if it is to be met it will require a major organisational and promotional effort by appropriate agencies of the Malaysian Government and by participants in the forest industry development.

Figure 24
Forest Industry Development Schedule

FOREST INDUSTRY DEVELOPMENT SCHEDULE

	1967												1968												1969					
PHASE (Months)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Jengka report presentation consideration and approval	Recommended / Alternative																													
Negotiations for foreign production and marketing participation																														
Design of production facilities and equipment order																														
Equipment delivery delay and preliminary construction																														
Final installation																														
Start up																														

The benefits of the recommended forest industry development are substantial. The industry can achieve high rates of return on invested capital and can form the basis of a modern Malaysian forest industry of large size able to compete effectively in world markets. Regionally, it would provide an estimated total of M$23,000,000 in royalties and concession premiums to the State of Pahang and would generate direct employment for about 750 workers plus considerable secondary employment in the area.

If the recommended programme is not implemented or is delayed so that the proven resource base is eroded and the industrial complex is no longer attractive to participants, these benefits would be reduced or lost and very large volumes of timber which cannot be saved and cannot be sold would be destroyed.

CHAPTER 5
PHASING AND MANAGEMENT

PHASING

The effective development of the Triangle as a whole during the next 12 years will be achieved only if the complex of operations is phased in an orderly sequence which takes account of limitations imposed by climate and scarcity of resources. If this is done the consequent implementation of the plan will result in the maximum financial and economic benefit.

The most efficient system of development requires that the development programme should be correlated with the phasing of the logging operations. The development programme has been planned not only to promote a successful timber enterprise but also to accomodate realistic operational targets for FLDA and other agencies associated with it in the development of Jengka.

Location of Phases

Since oil palms provide a greater and quicker return than rubber, the development of oil palm land has been given priority to that of rubber land. This principle provides benefit for the forest industry in that large areas considered more suitable for rubber in the centre of the Triangle also have large timber volumes. If these areas are let to the last, Jengka timber can be processed over a given period with the smallest plant capacity and capital investment.

The large area of suitable oil palm land on the east side of the Triangle and the benefits of continuing development near the FLDA Ulu Jempol oil palm scheme determined the location of the first project. Initial development in this area also allows agricultural development to take place without resulting in serious losses of valuable timber prior to the implementation of the recommended forest industry.

Pace of Development

The pace of development will be governed in the immediate future by the availability of management and supervisory staff. During this period development will initially be on a small scale, but it can rise over the period 1967-70 as resources become more available and development organisations especially contractors increase their capacities. By 1970 it should be possible to undertake a clearing programme of about 15,000 acres a year and a planting programme of over 12,000 acres a year, as well as constructing the related facilities.

Project Phasing

Project phasing is directly related to forest clearing and the planting of rubber and oil palms.

Agricultural Development - Forest clearance is critical to the implementation of project development. The speed at which it is under-

taken is governed by the limitations imposed by contractor and management capacity and by the economic advantages of rapid development. The gross acreages to be cleared annually are set out in Table 5. The annual net planting acreages are set out in Table 6. They follow one year behind land clearance and are smaller because provision has been made for village areas, roads and unusable land. The location of areas to be planted by years is shown in Figure 25.

During the build-up period to mid 1970, all of Project I and most of Project II, a total of 20,000 acres, should be planted. By mid 1973, 80 per cent of the oil palm land in the Triangle would be planted. In the latter years of development the larger acreages of rubber (Projects V and VI) would be developed and planted.

Village Development - The development of villages must begin as soon as land can be made available so that staff and settlers may arrive in time to assume responsibility for crop maintenance. The development of villages is phased to take place during a three year period in all projects except Project IV (Figure 26). Some flexibility can however be provided in the completion of villages because settler intake can be distributed over several months. It is also important that rural schools should be available very soon after settlers join the projects.

Table 5
Annual Forest Clearance Programme

	1966/7 [1]	1967/8	1968/9	1969/70	1970/1	1971/2	1972/3	1973/4	1974/5	1975/6	1976/7	Total [2] New Land
Project I	4,800	8,600	1,300									14,700
Project II			9,600	6,100	3,600							19,300
Project III				7,700	11,500	3,000						22,200
Project IV						11,800	4,600					16,400
Project V							8,400	4,600	8,600			21,600
Project VI								7,800	2,400	9,700		19,900
Total cleared	4,800	8,600	10,900	13,800	15,100	14,800	13,000	12,400	11,000	9,700		114,100

1) 1st July - 30th June
2) Does not include land added to existing FLDA Schemes (800 acres)

Processing Facilities - The phasing of the nine processing plants required for Jengka are shown in Figure 26. The phasing-in of new capacity, however, should be constantly reappraised in the light of changes in the rate, or location, of development and in the level of expected yields.

Figure 25

PHASING OF DEVELOPMENT

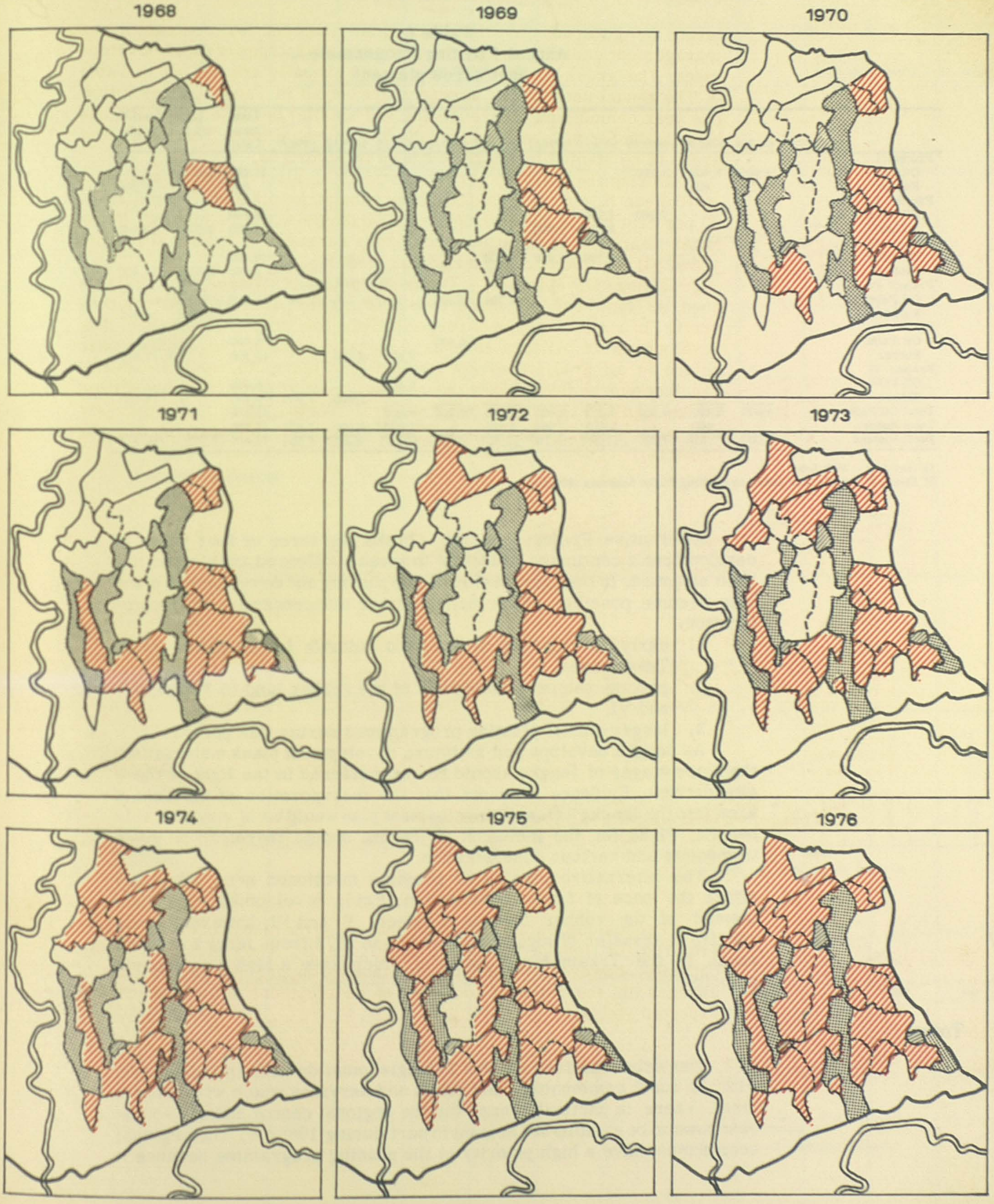


Table 6
Annual Planting Programme
(net acres planted)

	1966/7 [1]	1967/8	1968/9	1969/70	1970/1	1971/2	1972/3	1973/4	1974/5	1975/6	1976/7	Total New Land	Total FLDA	Total [2] Project
Project I														
Oil Palm		4,000	6,400	1,100								11,500	5,200)	
Rubber			600									600	)	17,300
Project II														
Oil Palm				7,900	2,900							10,800	)	
Rubber					2,000	2,800						4,800	3,800)	19,400
Project III														
Oil Palm					6,300	9,400	700					16,400	)	
Rubber							2,400					2,400	5,600)	24,400
Project IV														
Oil Palm							9,700	3,800				13,500	)	
Rubber												-	3,300)	16,800
Project V														
Oil Palm								6,900				6,900	)	
Rubber								3,600	6,700			10,300	)	17,200
Project VI														
Oil Palm								6,400				6,400	)	
Rubber									1,900	7,500		9,400	)	15,800
Total Oil Palm	4,000	6,400	9,000	9,200	9,400	10,400	10,700	6,400				65,500		
Total Rubber	-	600	-	2,000	2,800	2,400	-	3,600	8,600	7,500		27,500		
Total Planted	4,000	7,000	9,000	11,200	12,200	12,800	10,700	10,000	8,600	7,500		93,000	17,900	110,900

1) (1st July - 30th June)
2) Does not include land added to existing FLDA Schemes (800 acres)

Alternative Project Phasing - In the last three or four years of development a continuing reduction in acreages cleared and planted has been assumed. In this period alternative phasing and development plans may become possible; these include either independently, or in combination:

1. early development of the land suitable for oil palms in the Tekam area,
2. private sector development of the rubber land in Projects V and VI,
3. larger annual planting programmes during this period.

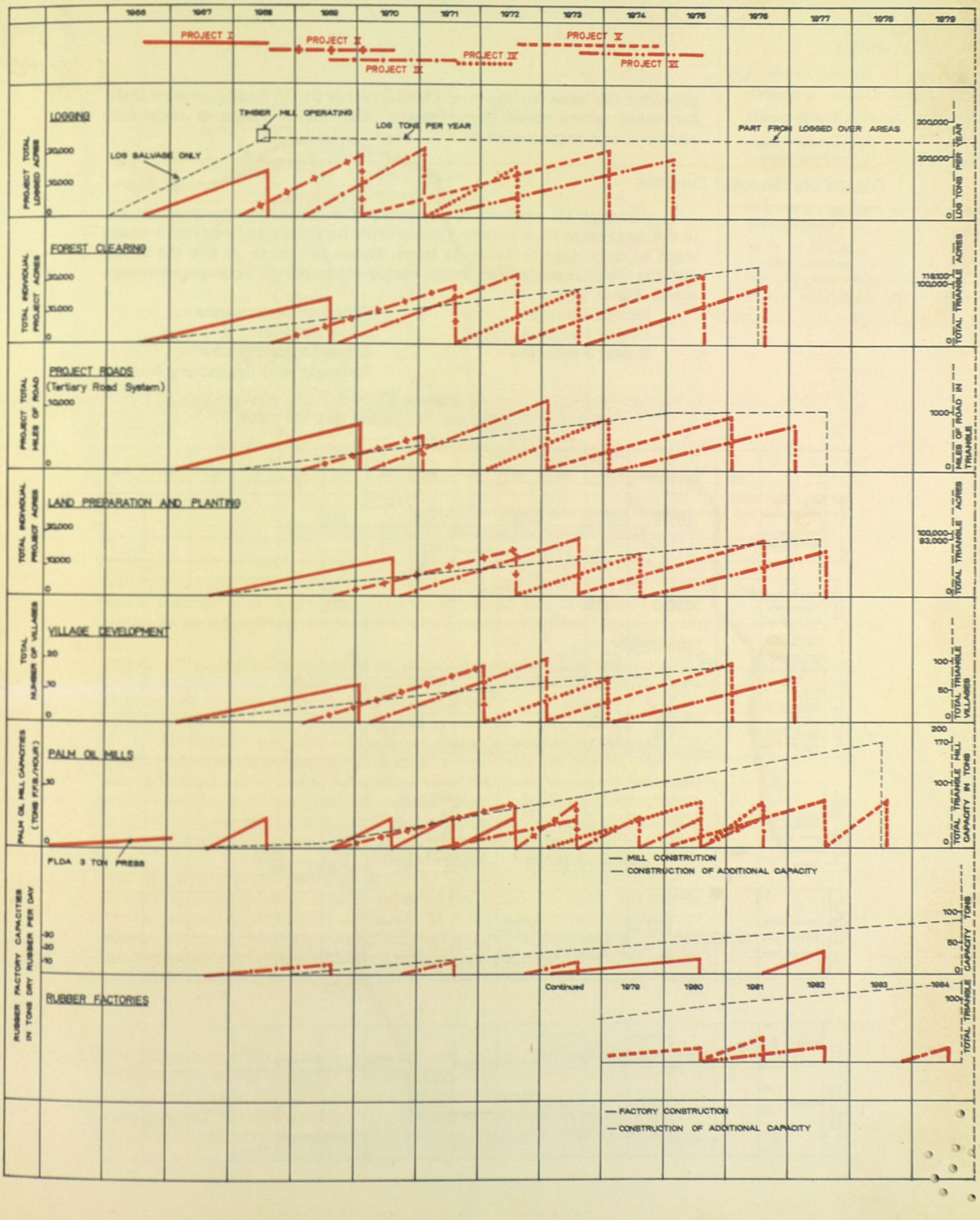
As Jengka develops and as future development plans materialise, the later stages of Jengka should be reconsidered in the light of these alternatives. Evidence suggests that the incorporation of the Tekam area into the Jengka Triangle development plan would be of considerable benefit. Plans for the inclusion of Tekam should therefore be given immediate and serious consideration.

The alternative phasing of projects mentioned here would not affect the pace of forest exploitation. Early development of Tekam instead of the rubber land in Projects V and VI, however, would require a transfer of logging operations in 1974 from Jengka to those areas in the Tekam forest reserve which have a high development priority.

Towns

The urban centres of the Triangle must develop in conjunction with the rural communities and roads and services which will support them. There is particular need for the regional centre and the south-east town to be established at least in part during 1968/69. The regional centre must have a high priority in the phasing programme because it

Figure 26
Summary of Project Phasing



provides the base for the forest industry, for FLDA headquarters staff, for other government departments, and for a range of necessary services and organisations.

Other Facilities and Services

Although all projects are capable of independent implementation, in the aggregate they create a demand for facilities and services which must be developed at Triangle level. Shown in Figure 27 are the broad phasing requirements for seven major elements of Triangle development. These are:

- Health Services
- Police Facilities
- Postal Facilities
- Telecommunications
- Town Schools
- Government Offices
- Primary and Secondary Roads

Figure 27
Phasing of Triangle Facilities and Services

Figure 28

ROAD CONSTRUCTION PHASING

LEGEND

By Government

Primary

Secondary

Year of initial construction ——— 1970

By Loggers

Primary

Secondary

Year of initial construction ——— 1968

(for logging use modified to P.W.D standard after logging)

JERANTUT

Bridge 1975 – 1977

1974

1976

1975

1972

1972

S. Tekam

1967

1973

1971

1970

1973

1972

1971

1969

1967

1973

1969

1968

1970

1971

1974

1973

1970

1968

1968

1971

1971

1969

1969

1969

1968

1969

1970

1970

1970

1970

S. PAHANG

Jengka

S. PAHANG

TEMERLOH

MARAN

Scale 1 Inch to 4 Miles

0 1 2 3 4 5 10

While most town schools serve mainly the town populations, in several instances the number of primary schools in towns have been increased to serve the immediate surrounding rural areas. Upper Secondary Schools and the Teacher Training School, all located in towns, would serve the entire Triangle.

The locations of annual phases of the primary and secondary road construction programme are shown in Figure 28. Construction of the Triangle's permanent network of these roads has been integrated with the construction of logging roads; the responsibility for initial construction of various road segments is also shown in the figure.

Management for Implementation and Operation

Successful implementation of the Jengka Plan involves not only control of costs and strict adherence to schedules, but careful integration of a number of activities some of which have a critical impact on the timing and success of others. This calls for a high standard of staff capability at all levels and an overall organisation which can efficiently coordinate all major activities.

Central direction and close administration of an agreed policy by an organisation with direst control over the facilities necessary for its purpose are required. The management responsible for this task should therefore have a high degree of autonomy. FLDA headquarters must however, remain responsible for broad policy and the general pattern and pace of Jengka development and its finance, and possibly also for matters of important public significance such as staff terms and final approval of major contracts.

It is envisaged that Jengka development and operation would be controlled by a small board of management whose chairman would be the chairman of FLDA, at least in the early years. He would be supported by two other members of the FLDA Board having special knowledge of land development on a large scale.

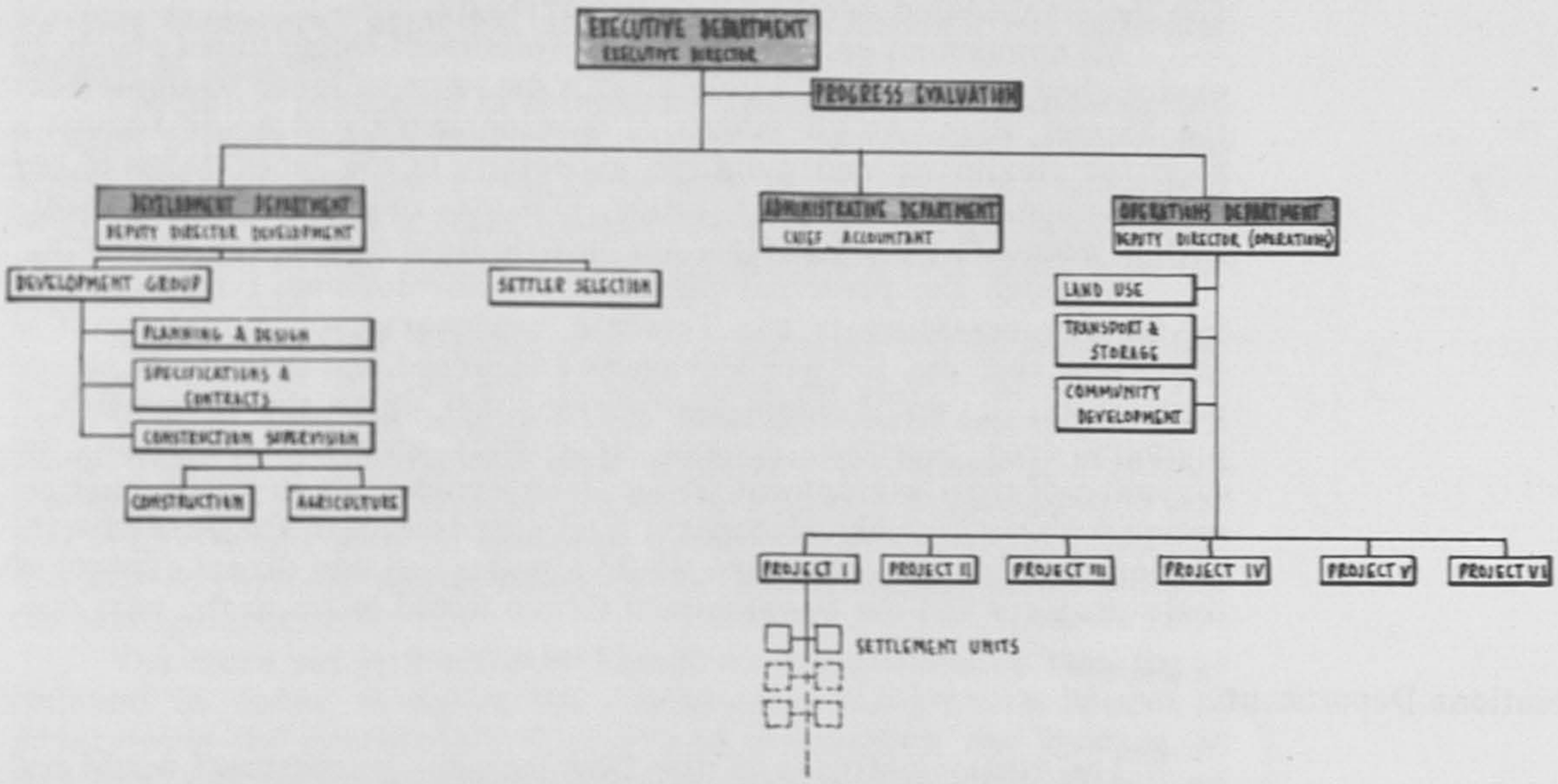
The chief executive to the Jengka board would be the Executive Director, responsible for implementing the Master Plan. He should be appointed soon after the adoption of the plan. He and his staff should be located in the Triangle from the outset.

The outline structure of the management organisation envisaged for Jengka is given in Figure 29. The major tasks of Triangle management would be twofold; the transitory task of planting, coordinating and directing development activities up to the completion of main crop planting, and the continuing duty of directing and administering Jengka operations and providing certain centralised services. Therefore the management structure for the Triangle is broadly divided into a Development Department and an Operations Department which would be responsible to the Executive Department, and supported by an Administration Department.

Executive Department

The Executive Director of the Jengka Triangle must establish a highly flexible but close coordination of all Triangle activities, with emphasis initially on the carefully timed implementation of the plan. A progress Evaluation Section directly responsible to the Executive Director is proposed (Figure 29); this would keep him constantly

Figure 29
Outline Management Structure



informed of progress in all aspects and stages of development and operation, assess the adequacy of progress, and make recommendations for its improvement.

Development Department

Although development will take place project by project, the highly specialised team functions of planning, design and construction of each project should be undertaken centrally. For this function a development group consisting of sections for planning and design, specifications and contracts, and construction supervision is proposed.

The Planning and Design Section would be responsible for the orderly evolution of the Plan as a whole, preserving a balance between such operations as timber utilisation and land clearance and related development of roads, utilities and other services for the individual projects in their sequence. A key function of it would be coordination with other government departments, for example, Survey of Public Works, which would be directly involved in development. Since much of the construction work associated with agricultural development of the type envisaged in Jengka involves relatively simple engineering and layout tasks, it is probable that the Section would be able to undertake a considerable range of final planning and design.

The Specifications and Contracts Section, in coordination with Planning and Design, should consider at all times the advantages of grouping work items so as to offer larger contracts and assist in the growth of effective local contractor organisations.

A Construction Supervision Section would be needed to provide direct site supervision of such critical tasks as clearing, holing, planting, and village development.

Within the Development Department, a Settler Selection Group would also be established. Its function would be to assure the orderly selection of settlers in coordination with other participating agencies, and their scheduled movement to the Triangle.

All component sections of the Development Department should be established as soon as possible after a decision is made to implement the Master Plan. At all stages of development there would remain a need for flexibility and mobility, especially in the supervision of key contract operations such as planting. This may require radio communication, adequate field vehicles, and mobile field offices and quarters.

Although the principal planning and development function would be the responsibility of the Triangle headquarters organisation it is important that the Project Managers concerned and their staff should participate. It would seem appropriate that up to the completion of primary crop planting, project field staff should come under the direction of the Development Group, who would work in close collaboration with the Project Managers. At the conclusion of the development phases the Project Managers would assume full and direct control of their projects and the Development Group would move to the next one.

Operations Department

The responsibilities of the Development Department would end with the completion of planting the last project. The Operations Department would provide the central line of operational management extending from Triangle headquarters to settlement units (Figure 29).

Headquarters Sections - At Triangle headquarters, the Operations Department have the continuing task of directing and coordinating the major policy activities of the projects and providing for them certain specialised technical and advisory services.

The Land Use Section is particularly important. It would furnish technical advice to projects on crop agronomy, land use practices, fish farming and the like. Much of this technical knowledge would be obtained by keeping in touch with appropriate research and experience outside the Triangle. This would be supplemented by practical information of specific application to Jengka conditions developed by a small investigation staff in the Section.

Other sections of the Operations Department include Community Development and Transport and Storage. The latter would be concerned mainly with the coordination of all aspects of handling palm oil, palm kernel and rubber, including arrangements for contract transportation, scheduling of movements to ports, and control of product inventories.

Project Management - Project Managers should have a high degree of executive autonomy within the Operations Department; they would be subject to instructions directly from the Deputy Executive Director (Operations) and the Executive Director. Project managers should be appointed in time to assist the Planning and Design Section to plan the projects.

Key functions at project management level would include factory and mill operations and crop transport. A capable transport controller would be needed to arrange contract hauling services, supervise transport operations, and provide effective liaison with settlement unit managers.

Agricultural extension specialists should be assigned to the head-

quarters of the projects to advise settlers and settlement unit staff on methods of efficient crop production. They would be in close touch with the Land Use Section at Triangle headquarters and would be the Project Managers' principal assistants in supervising the technical aspects of land use.

Specialist personnel in community development would be attached to each project during the initial years. In the course of supervising social services and generating community activities they could assist settlers in selection of their leaders, making the village increasingly self-sufficient in this respect. This would gradually reduce the need for paid project staff.

Settlement Unit Management - Ultimately the success of the Jengka Triangle will depend largely upon the field staff who are in daily contact with the smallholders. The pattern of settlement units lends itself to a subordinate staff structure of Managers, Assistant Managers and Senior Supervisors on the existing FLDA model. Field Assistants would also be assigned, principally to record crop yields, and also to perform lesser duties in the field under the supervision of the Management staff.

The more senior field staff should be engaged before clearing is finished in order to assist the Construction Supervision Section in supervising the contractors during land preparation and planting. In this way field staff would become familiar with the character of the land for which they would be responsible. This is the foundation of good farming.

Administrative Department

At Triangle headquarters centralised accounting procedures utilising modern techniques of data collection, storage and computation are desirable. An administrative department is proposed which would provide this service for all elements of the Triangle undertaking, including settler accounts (Figure 29). Other functions of the Department would be payroll, personnel, control of inventories, and supervision of maintenance of FLDA staff housing, offices and other facilities. The objective of the Administrative Department would be to assist project and settlement unit management staff in the performance of the primary production responsibility, by relieving them of ancillary functions that can be efficiently handled centrally.

Staff Requirements

The numbers of staff proposed represent a substantial addition to the FLDA establishment. Nearly 40 professionally qualified staff would be required during the next 10 years and over 110 technically trained managers and assistant managers would be needed.

For several posts, such as that of Executive Director, as well as certain key positions in the Development and Operations Departments, and possibly the project managers of the initial projects, suitable local personnel with the requisite experience may be impossible to find. Provision for this contingency has been made in the financial analyses of the Plan. In the longer term, however, this and all other posts should be filled by recruitment of local personnel. Where external staff assistance is necessary steps should at once be taken to recruit trainees locally.

The greatest numbers of personnel are required at settlement unit level. It is proposed that Managers should initially control two or three settlements totalling approximately 2,000 to 2,500 acres, depending upon individual size and location of settlements and managerial capability. Later this number may be increased to three, four or more depending upon circumstances. Assistant Managers are each allocated one settlement at the outset but an ultimate responsibility for two has been assumed. The numbers of Senior Supervisors have been assessed on a primary relationship of one for every 50 settlers decreasing ultimately to one for every 100 settlers. Initially the density of staffing at settlement unit level is set intentionally high until both staff and smallholders are capable of fulfilling their functions efficiently.

Adequate facilities exist in West Malaysia through its University for graduate training of staff for senior professional posts, and through its technological institutions for technical training of junior staff. As Jengka develops and staff numbers increase the in-training courses provided for staff will require expansion.

Staff Phasing

Triangle Headquarters - At Triangle headquarters certain responsibilities should be assumed with the minimum of delay. In particular the Executive Director and the staff of the Development Department should be in post as soon as possible (Figure 30). The investigational staff, because of their long term programme and the Chief Accountant, because of the immediate need for accounting and stores control, should start work soon after development operations have commenced.

The assignment of remaining personnel in Triangle headquarters should follow broadly the timing of development. With the completion of crop planting in all projects, the responsibilities of the Development Group will end, except for those of the resident construction engineer who will remain until all palm oil mills and rubber factories have been built.

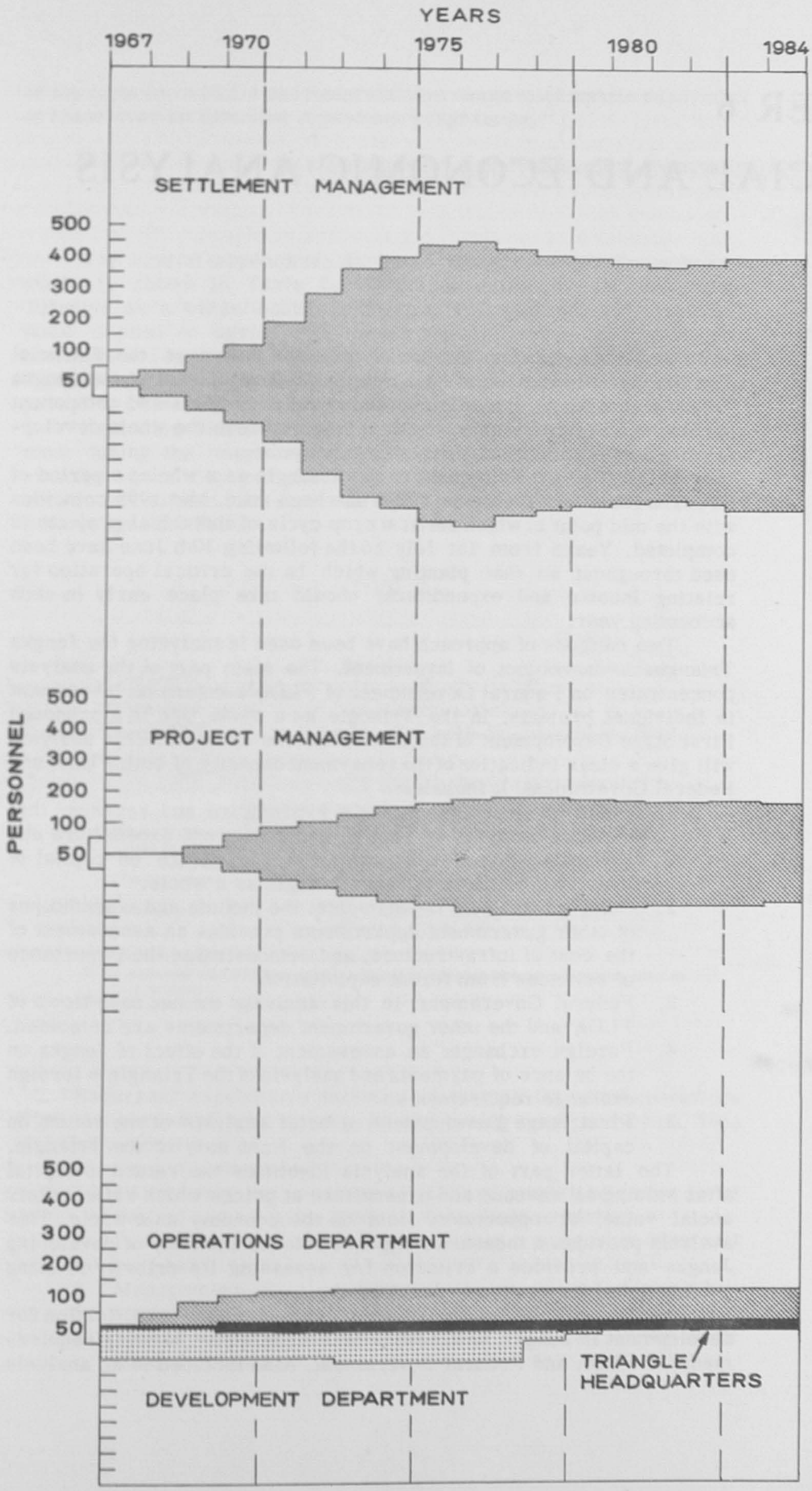
Within the Operations Department community development personnel would have a temporary function only. They should prepare the settlers for greater responsibilities; thereafter the initiative to sustain social development should come from the settlers.

Project and Settlement Unit Management - At project and settlement unit management levels, staff build-up would be closely tied to construction and development.

With the evolution of Jengka, management functions will change. Initially both management and smallholders will be inexperienced in their respective activities. At this time it is essential that management should be sufficiently numerous to assure adequate supervision and guidance of settlers. The staff complement is designed to provide this and different levels of staff are assigned to their duties accordingly. In time, however, levels of settlement unit management can be reduced (Figure 30).

It is believed that the role of management in Jengka can ultimately change completely. In the future it should consist solely of the provision of extension advice by a relatively few well trained and experienced men and of such specialised services as transport, processing, maintenance and accounting.

Figure 30
Staff Phasing



CHAPTER 6
FINANCIAL AND ECONOMIC ANALYSIS

The financial and economic analysis assesses the financial viability and the economic justification of development of the Jengka Triangle as a whole. It also assesses individual projects and component parts with a view to establishing their importance to the whole development and their individual financial viability.

In analysing development of the Triangle as a whole, a period of 32 years from mid 1966 to mid 1998 has been used. Mid 1998 coincides with the mid point at which the first crop cycle of individual projects is completed. Years from 1st July to the following 30th June have been used throughout so that planting, which is the critical operation for relating income and expenditure, should take place early in each accounting year.

Two methods of approach have been used in analysing the Jengka Triangle as an object of investment. The main part of the analysis concentrates on Federal Government of FLDA's return on investment in individual projects, in the Triangle as a whole, and in a proposed First Stage Development of the east side of the Triangle. This analysis will give a clear indication of the repayment capacity of both FLDA and Federal Government. It includes:

1. FLDA project and Triangle expenditure and revenue: this includes analysis of capital and recurrent expenditure and revenues and an assessment of the return on capital of individual projects and the Triangle as a whole.
2. Other government departments: the income and expenditures of other government departments provides an assessment of the cost of infrastructure, and demonstrates the importance of revenues from forest exploitation.
3. Federal Government: in this analysis the net cash flows of FLDA and the other government departments are combined.
4. Foreign exchange: an assessment of the effect of Jengka on the balance of payments and analysis of the Triangle's foreign exchange requirements.
5. First Stage Development: a brief analysis of the return on capital of development on the East side of the Triangle.

The latter part of the analysis identifies the return to capital after valuing all revenue and expenditure at prices which reflect their social value, or opportunity cost to the economy as a whole. This analysis provides a measure of the benefit to the economy of developing Jengka and provides a criterion for assessing its priority in using public capital for economic development.

Having established the financial and economic justification for development in Jengka, an assessment is made of the financing requirements of FLDA and Federal Government. Also included is an analysis

of the capacity of FLDA and Federal Government to complete repayment of loans over an assumed repayment programme.

FLDA PROJECT AND TRIANGLE EXPENDITURE AND REVENUE

Capital Expenditure

The capital expenditure for each project and the Triangle as a whole is shown in Table 7. The total capital expenditure for the Triangle as a whole would be about M$240 million. This consists of fixed capital in agricultural development, processing plants, and buildings and equipment; working capital to finance stocks and recurrent expenditure; and expenditure on management and maintenance during the period of immaturity in rubber and oil palm.

Excluding capital investment in processing factories, in management during the immature period and in Triangle Headquarters, the average capital cost per planted acre is about M$1,375. This compares with recent expenditure levels by FLDA of M$1,250 - 1,400 per planted acre on small schemes.

Table 7

	Project						Triangle Head-quarters	Triangle Total [3]
1. Fixed Capital	I	II	III	IV	V	VI		
a) Agricultural Development	8.2	10.1	12.4	9.3	10.1	9.6	-	59.7
b) Management	1.4	1.5	2.0	1.6	1.6	1.3	2.2	11.6
c) Processing	5.8	7.6	8.4	6.8	8.3	1.5	0.7 [1]	39.1 [2]
Total Fixed Capital	15.4	19.2	22.8	17.7	20.0	12.4	2.9	110.4
2. Working Capital	3.1	3.8	4.5	3.2	3.6	3.2	-	21.4
	18.5	23.0	27.3	20.9	23.6	15.6	2.9	131.8
3. Immature Period Expenditure								
a) Crop Maintenance	2.1	3.3	3.4	2.2	4.0	3.6	-	18.6
Road Maintenance (Tertiary) and Transport	1.0	1.0	1.3	1.3	0.9	0.8	-	6.3
c) Settler Income	3.8	5.6	6.3	4.1	7.3	6.7	-	33.8
	6.9	9.9	11.0	7.6	12.2	11.1	-	58.7
d) Management	4.7	5.5	6.7	5.7	5.2	4.1	17.5	49.4
	30.1	38.4	45.0	34.2	41.2	30.8	20.4	239.9

1) Palm oil installation at Port Swettenham
2) An additional M$4.8 million will be required to complete factory construction sited on FLDA Schemes
3) Shown itemized in Appendix 26 - 1

Recurrent Expenditure

Recurrent expenditure includes cost to FLDA of all operations after the period of crop immatority and during crop production. This includes expenditure on:

1. Crop maintenance.
2. Harvesting, maintenance of tertiary roads and transport of rubber and oil palm products from field to factory.
3. Processing and marketing including transport to port and port handling.
4. Management.
5. Settler income, assumed to rise from M$1,200 in the second year of production to M$1,800 by the end the first crop cycle in each project.

Table 8 shows annual recurrent expenditure in each project and for the Triangle as a whole after full production has been reached. This level is achieved early in Project I because it is almost entirely an oil palm project; later projects with large rubber acreages do not reach full production until the later 1980's. Excluding settler income, recurrent expenditure is constant at M$24.4 million during full production; settler income rises throughout each project's first crop cycle which is assumed to be 25 years. Total recurrent expenditure rises to M$41.1 million by 1997/8.

Table 8

FLDA Project and Triangle Annual Recurrent Expenditure [1]
at Full Production M$ million

	Project						Triangle Head-quarters	Triangle Total [3]
	I	II	III	IV	V	VI		
1. Crop Maintenance	1.0	1.1	1.5	1.1	1.0	0.9	-	6.6
2. Harvesting Roads and Transport	0.6	0.5	0.7	0.5	0.5	0.5	-	3.3
3. Processing and Marketing	1.4	1.5	2.0	1.5	1.4	0.9 [2]	-	8.7
4. Management	0.7	0.8	0.9	0.8	0.9	0.8	0.9	5.8
	3.7	3.9	5.1	3.9	3.8	3.1	0.9	24.4
5. Settler Income 1985/6	2.1	2.6	3.1	2.2	2.6	2.4	-	15.0
Total Recurrent Expenditure 1985/6	5.8	6.5	8.2	6.1	6.4	5.5	0.0.9	39.4
6. Settler Income 1977/8	2.2	2.8	3.4	2.4	3.1	2.8	-	16.7
Total Recurrent Expenditure 1997/8	5.9	6.7	8.5	6.3	6.9	5.9	0.9	41.1
Start of Full Production	1979	1982	1983	1982	1985	1989		1989

1) Excludes land taxes payable to the State of Pahang at M$6 per acre.
2) At full production in 1989 expenditure should be M$1.2 million. At Triangle level in 1989 this rise of M$0.3 million is offset by falling expenditure on rubber processing and marketing in Project II.
3) Itemized in detail in Appendix 26 - 2

Revenue

The annual revenue from individual projects is shown in Table 9 for the period from the first year of production 1970/1 to 1985/6 and for selected years thereafter. Revenue was obtained by deducting the value of duties and cesses from the expected f.o.b. values of rubber, palm oil and palm kernels, which are shown for selected years in Table 9. Prices of rubber and oil palm products are expected to fall rapidly in the 1970's. Prices are expected to continue falling, but less rapidly until year 2,000. It is assumed that the FLDA will be eligible for a refund of that part of the rubber cess assigned for replanting purposes. The speed at which revenue is generated is again dependent on the proportion of oil palm land and the project's individual phasing pattern. Thus project IV, being developed over two years and being all oil palms, would generate a large and rapid increasing income by comparison with other projects. The effect of falling prices in both rubber and oil palm products has the effect of depressing incomes per acre in the later projects.

Table 9
FLDA Project and Triangle Revenue M$ Millions

Project	1970/1	1971/2	1972/3	1973/4	1974/5	1975/6	1976/7	1977/8	1978/9	1979/80	1980/1	1981/2	1982/3	1983/4	1984/5	1985/6	1990/1	1995/6	1997/8
I	1.2	4.1	7.2	9.5	10.4	10.7	10.9	11.0	10.8	10.6	10.4	10.3	10.2	10.1	10.0	9.9	9.4	9.2	9.2
II	-	-	2 2	5.1	8.0	9.3	10.5	11.5	12.2	12.5	12.6	12.6	12.5	12.4	12.3	12.2	11.6	11.2	11.2
III	-	-	-	1.7	6.0	10.1	12.9	14.0	14.9	15.3	15.5	15.6	15.5	15.6	15.2	15.3	14.4	14.1	14.1
IV	-	-	-	-	-	2.6	6.4	9.6	10.4	11.0	11.2	11.4	11.5	11.5	11.2	11.1	10.5	10.4	10.4
V	-	-	-	-	-	-	1.8	3.5	5.8	6.7	8.6	10.5	11.7	12.7	13.1	13.4	13.1	12.7	12.5
VI	-	-	-	-	-	-	-	1.6	3.2	4.7	5.2	6.9	8.7	9.8	10.6	11.1	11.3	11.0	10.8
Less: Transfer Payment [1]	-	-	-	-	-	-	(0.4)	(0,3)	(0.6)	(0.7)	(0.8)	(0.8)	(0.8)	(0.9)	(0.9)	(0.9)	(0.9)	(0.9)	(0.9)
TOTAL	1.2	4.1	9.4	16.3	24.4	32.7	42.1	50.9	56.7	60.1	62.7	66.5	69.3	71.2	71.5	72.1	69.4	67.7	67.3

Expected f.o.b. Price [2]				
M$ per ton	1970/1	1980/1	1990/1	1997/8
Palm oil	550	450	405	400
Palm kernels	350	300	277	275
M cents per lb.				
Rubber	60	50	46	45

1) Incomes per acre for years 1970/1 - 2000/1 shown in Appendix 26 - 3
2) Revenue included in Projects IV and V for processing of oil palm from Projects V and VI. M$0.4 million 1976/7 applies to revenue from Project IV. Thereafter transfer payments apply to revenue from Project V.

Return on Capital of Individual Projects

Using the project revenue and expenditure summarised in Tables 6, 8 and 9, the net cash flows for each project have been computed and are shown in Figures 32 and 33 for the years up to 1998. The period of cash flow for the earlier projects finish 3 to 4 years before the end of the plan period. Those for later projects finish 3 to 4 years later. In addition to the expenditures summarised in Tables 7 and 8 the project cash flows include small sums for each project for land taxes paid to the State of Pahang. These are assumed to be a premium of M$60 per acre paid as the crop comes into production and an annual rent of M$6 per acre thereafter.

Projects I, III and IV generate substantial surpluses immediately after the end of their respective investment periods. Projects II, V and VI with their higher proportion of rubber take longer to reach peak levels of surplus. All projects suffer declining surpluses in the later years of their first production cycles.

Using the discounting process, rates of return on capital for individual projects have been interpolated and are shown in Table 10. The factors affecting the return on capital are complex. Size and a high proportion of oil palms tend to increase the return on capital. Early development enjoys higher product prices, but this is counteracted in some degree by the greater density of management planned for the first years of the earlier projects. These factors result in a fairly narrow range of profitability.

The rates of return shown in Table 10 indicate that all projects would be able to make a contribution to Triangle Headquarters and infrastructure in that they show a substantial margin in excess of 6 to 7 per cent. This is the rate of return that would be required if each pro-

ject was to break even by recovering its own development expenditure. Even projects V and VI, which with their high proportion (60 per cent) of less profitable rubber but with lower management densities, make returns to capital 2.5 to 3 per cent in excess of the minimum return that would be required for them to break even.

Table 10
Return of FLDA Capital by Projects

Project	Planted Acreage	Percent Oil Palm	Repayment Period: Investment Period	Repayment Period:	Percent Return on Capital [1]
I	12,100	95	1966 - 1973	1973 - 1994	11.1
II	15,600	69	1968 - 1974	1974 - 1996	10.6
III	18,800	87	1969 - 1975	1975 - 1997	11.0
IV	13,500	100	1971 - 1977	1977 - 1999	10.5
V	17,200	40	1972 - 1978	1978 - 2000	9.7
VI	15,800	40	1973 - 1980	1980 - 2001	9.4

1) See Appendix 26 - 8

Full Triangle Development

Expenditure Revenue and Cash Flow - The total capital expenditure by FLDA required to bring all projects into production would be about M$240 million (Table 7). Out of this total, about M$170 million would be needed during the seven years 1970/1 to 1976/7 and expenditure would rise to a peak of M$31.2 million in 1972/3.

Recurrent expenditure rises throughout the production period from 1970/1 onwards. Settlers income which forms over 50 per cent of recurrent expenditure after 1982 rises steadily throughout the period. All other recurrent expenditure remains constant after 1985/6. Triangle revenue comprises the total of revenue from all six projects (Table 9).

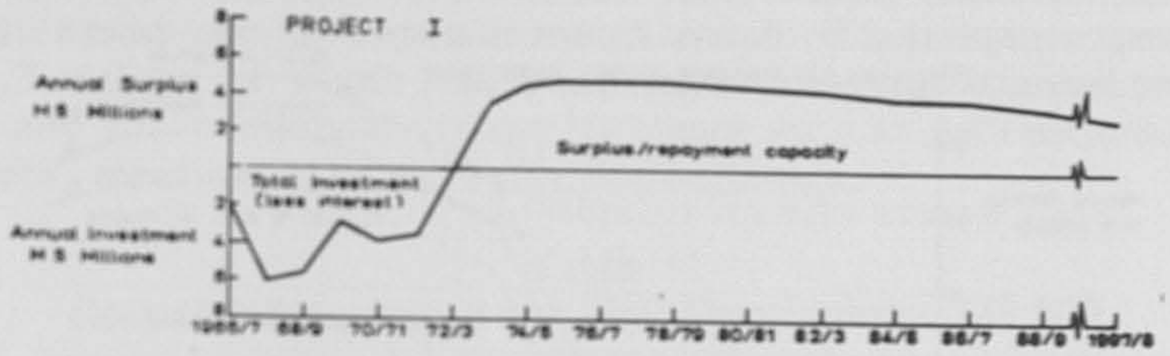
Expenditure and revenue have been combined to give the net cash flow for the Triangle as a whole. This is shown in Figure 34 and forms the basis of all financial requirements and repayment capacity. To demonstrate the effect of price changes in the primary commodities, Figure 34 also shows the effect on cash flow of a rise and fall of 10 per cent in prices received by FLDA.

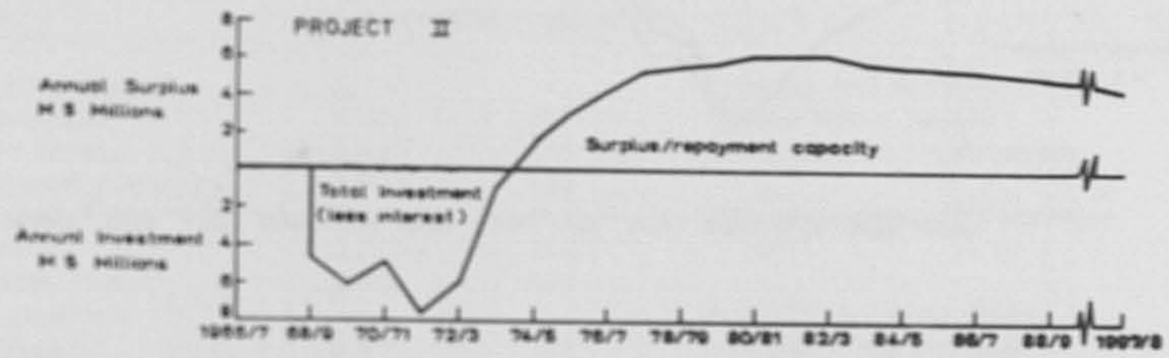
From Figure 34 it can be seen that the FLDA investment period would be eleven years from 1966/7 to 1976/7 after which FLDA would generate a cash surplus from the Triangle as a whole, although investment would still be in progress in individual projects (V and VI). The total investment required would be about M$149 million which represents the sum of accumulated cash flow deficits 1966/7 to 1976/7. This sum, plus interest, is the FLDA financial requirement for Jengka.

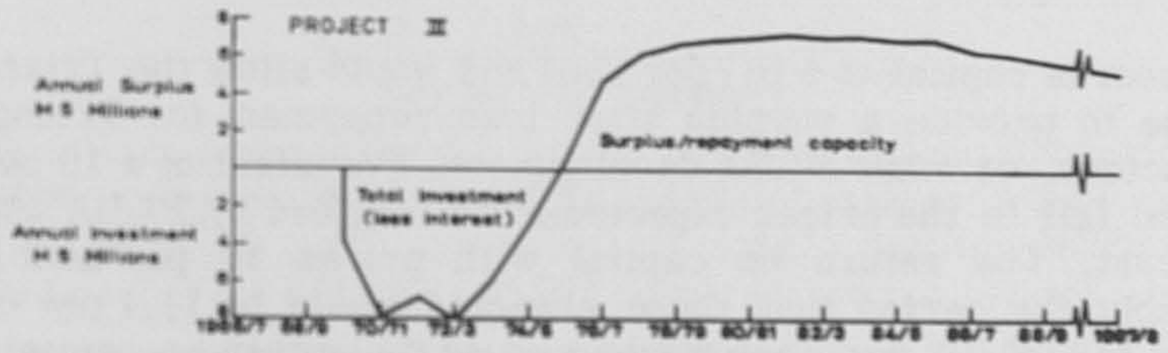
The annual cash surplus would rise to M$31.9 million by 1985/6 and would fall to M$25.6 million per year by the end of the plan period as a result of rising settler incomes and falling commodity prices.

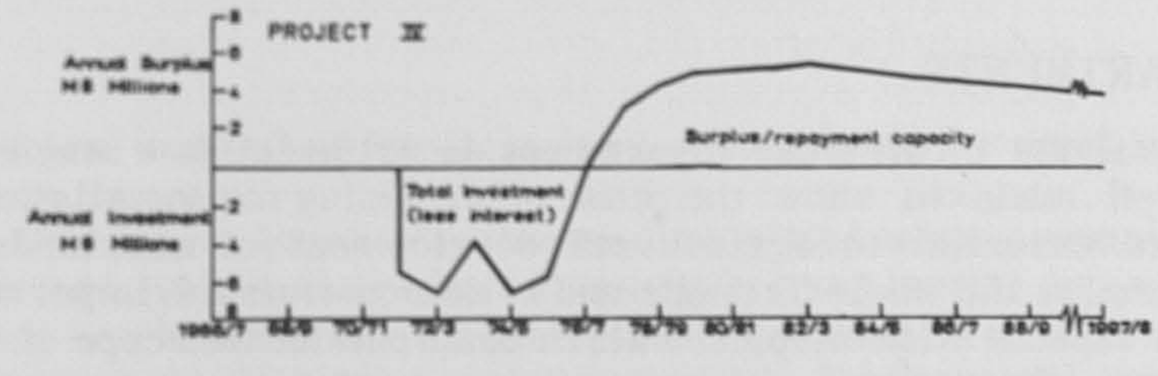
Return on Capital - Using the discounting process FLDA would obtain a return of 9.1 per cent on its investment at the level of settler income proposed. This represents a very adequate return in view of the

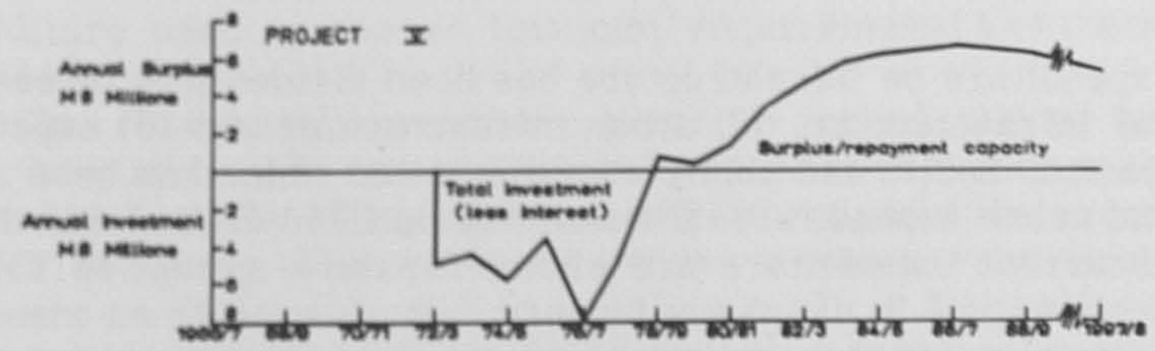
Figure 31
Project Cash Flows











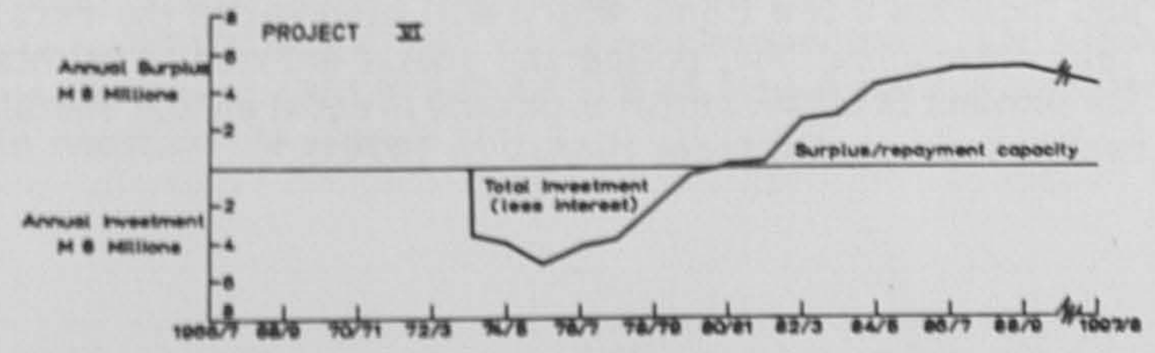
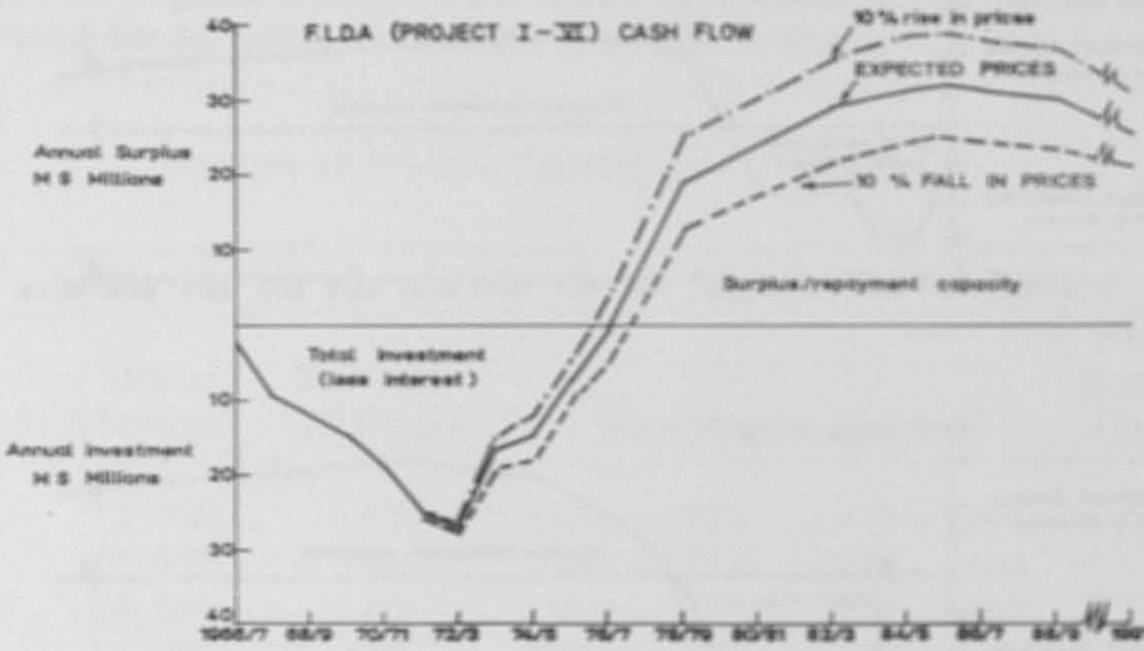


Figure 32
FLDA Triangle Cash Flow



likely cost of capital of 6 to 7 per cent and would allow the Triangle as a whole to provide a surplus after loan repayment for Triangle infrastructure, or other FLDA development. The effect of a 10 per cent rise and fall in the prices expected to be obtained by FLDA would be significant. The return on capital with prices 10 per cent higher throughout the period than those expected would be 11.4 per cent. A similar fall of 10 per cent would reduce the return on capital to 6.4 per cent.

OTHER GOVERNMENT DEPARTMENTS

Analysis to all other government departments as a single entity has been made to show the cost of providing the installations and services essential to agricultural development of new land infrastructure for the whole Triangle and to demonstrate the importance of certain aspects of development which come outside the scope of FLDA.

Infrastructure Expenditure

Expenditure on infrastructure has been divided into three groups (1) rural infrastructure, (2) urban infrastructure and (3) expenditure on education, health and public administration which has been termed rural and urban expenditure. Expenditure on fixed capital and the long term recurrent expenditure are shown for these groups in Table 11.

Urban infrastructure - Urban infrastructure expenditure comprises the fixed capital required to develop the three towns planned for Jengka and includes a few items which will also serve the rural areas notably telecommunications, police and postal service. The total fixed capital investment is M$29.3 million phased in equal annual installments over a twelve year period from 1968/9 to 1979/80.

Rural infrastructure - Rural infrastructure expenditure consists mainly of the construction and operation and maintenance of the primary and secondary road network and the water supply units for the settlements. Fixed capital expenditure in rural infrastructure amounts to M$43.3 million of which M$1.6 million is for river channel improvement and for communal village buildings such as recreational areas, markets, meeting halls and religious buildings.

Table 11
Cost of Infrastructure at Full Development M$ 000

	Urban Expenditure			Rural Expenditure	
	Fixed Capital	Recurrent 1978/9 onwards		Fixed Capital	Recurrent 1977/8 onwards
Site Preparation	4,900	-	Primary and Secondary Roads	28,459	1,200
Town Roads	7,500	157	Village Water Supply	13,252	1,164
Water Supply	2,320	148	River channel improvement	20	70
Telecommunications 1)	2,900	123			
Postal Services 1)	440	166	Village Community Facilities	1,579	313
Police 1)	2,270	714			
Electric Power	3,400	520		43,310	2,747
Sanitation and Drainage	3,430	35	Plus 10% to cover other miscellaneous services		275
Airport	1,150	41			
Miscellaneous	1,000	96			3,022
	29,310	2,000			
	Rural and Urban Expenditure				
Health	4,433	670			
Education	25,570	37,850			
Public Administration	5,000	250			
	35,003	39,770 2)			

1) These also provide limited services for the rural area.
2) Excluded throughout the economic and financial analysis.

Rural and Urban Infrastructure - The category of rural and urban expenditure requires special treatment in the analysis. It includes expenditures on education, health and public administration. Since Jengka involves development of new land, fixed capital expenditure in building new schools, health centres and public department offices represents a true cost of new land development. Consequently expenditure on these elements (M$35.0 million) has been included in the total expenditure used to assess financial requirements and the return on capital.

The recurrent expenditure incurred for education, health and public administration rises with the investment in buildings to M$39.8 million annually by 1981, but is excluded throughout the economic and financial analyses. The operation of these services is not considered to represent an additional cost incurred as a result of Jengka development since these costs would be incurred elsewhere in the economy whether Jengka was developed or not.

Total fixed capital expenditure on infrastructure of all kinds amounts to M$107.6 million. Recurrent expenditure is assumed to rise between the years 1968/9 and 1978/9 to M$5.0 million per year and to remain constant thereafter.

Revenue

The revenue received by other government departments is shown in Table 12. The principal sources of revenue are:

1. Export duties on the f.o.b. value of palm oil, kernels and rubber.
2. Sundry taxes including additional commercial vehicle taxes, import duties and charges made by Port Swettenham Authority.
3. Revenue from the sale of urban land within the three towns.
4. Revenue from supplying public services including charges for telecommunications, electric power and postal services. Also included as a Federal Government item is the revenue to be received for operating the rural and urban water supplies. This has been included to offset the cost of operation.
5. Company Taxes including taxes on profits made by the timber industry; these are expected to total about M$39 million, most of which will be received in the eight years from 1970-78. Taxes from other industry are assumed to be comparable to those received from the timber industry. However it is assumed that profits and taxes from other industry will rise by 1981/2 to 50 per cent of the 1978 level in the timber industry and to 100 per cent of this level by the end of the plan period 1998.

Due to the rapid generation of revenues from taxes on timber profits, revenue to other government departments rises rapidly to M$10.3 million by 1973/4 and reaches a peak of M$15.1 million in 1977/8. After a decline in revenue to M$10.9 million in 1980/1, revenue is expected to rise steadily throughout the rest of the plan period.

The revenues accruing to the State of Pahang are shown separately in Table 12. These arise from royalties from timber extracted in the logging operation and from land taxes on agricultural land. These have

Table 12
Revenue to Other Government Departments
from Full Triangle Development M$ 000

Federal Government	1967/8	1968/9	1969/70	1970/1	1971/2	1972/3	1973/4	1974/5	1975/6	1976/7	1977/8	1978/9	1979/80	1980/1	1981 to 1997	1997/8
Export Duties and non-refundable cesses	-	-	-	0.1	0.3	0.7	1.3	2.0	2.7	3.4	4.1	4.5	4.8	5.0	rising	5.1
Motor Vehicle Taxes	-	-	-	0.3	0.3	0.3	0.3	0.3	0.6	0.6	0.6	0.6	0.6	0.9	rising	1.3
Import Duties	-	0.1	0.2	0.2	0.2	0.4	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Port Charges	-	-	-	-	-	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
Sale of Urban Land	-	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	-	-	-
Public Services [2]	0.1	0.3	0.6	0.7	1.1	1.2	1.4	1.5	1.8	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Company Taxes:																
Timber Industry	0.3	1.5	2.6	2.8	3.1	3.6	4.3	4.6	4.6	4.6	4.6	2.3	-	-	-	-
Other Industry	-	0.4	0.5	0.7	0.7	1.0	1.1	1.2	1.4	1.6	1.7	1.9	2.0	2.1	rising	4.6
	0.4	3.6	5.2	6.1	7.2	8.6	10.3	11.6	13.1	14.1	15.1	13.5	11.6	10.9	rising	13.9
State Revenue [1]																
Timber Royalties	0.3	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	1.1				
Land Taxes	-	-	-	0.4	0.6	0.8	0.9	1.1	1.3	1.3	1.0	0.7	0.9	1.2	0.6	0.6
	0.3	2.2	2.3	2.6	2.8	3.0	3.1	3.3	3.5	3.5	3.2	1.8	0.9	1.2	0.6	0.6

1) Excluded in assessing Government repayment capacity.
2) Including State Water Supply.

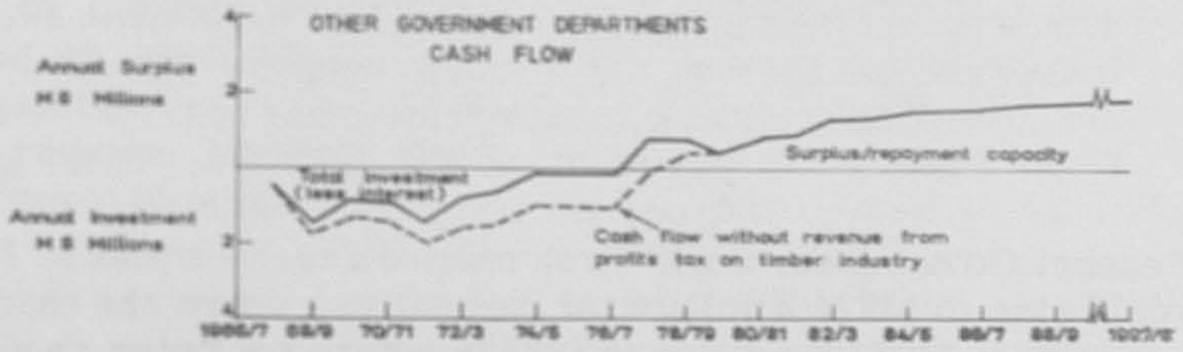
been excluded in any analysis of repayment capacity since Federal Government is unable to acquire any direct revenue from the State government, or to effect savings by reductions in Federal Government grants to State government.

Cash Flow and Return on Capital

The cash flow of other government departments as a single entity is shown in Figure 35. The investment period would be from 1967/8 to 1976/7 during which M$32.7 million would be required to finance the cash deficit, not including interest.

The discounting process gives a return on capital of 9.1 per cent to other government departments. This provides a clear margin over the 6 to 7 per cent return that would be required to provide adequate repayment capacity.

Figure 33



The expenditure on construction of schools, health centres and public offices forms a large part of investment. Their exclusion from the investment would allow a return on capital well in excess of 12 per cent.

The importance to government of the taxes from timber must be emphasised. Exclusion of these taxes from revenue reduces the return on capital to 4.5 per cent. Thus revenue would be insufficient to provide financial viability. The contribution to profitability of revenue from timber profits is very significant because it substantially reduces the investment required for development of the essential infrastructure.

The implications of this analysis are that provision of infrastructure for Jengka can be justified without drawing on FLDA surplus. Provision of infrastructure is financially sound by itself regardless of the system of agricultural development either by the public, or private sector. This comes as a direct result of efficient forest exploitation.

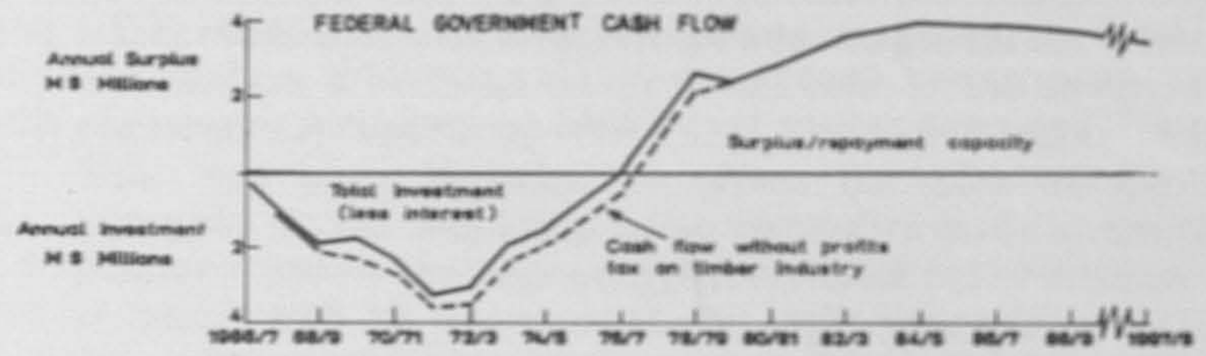
FEDERAL GOVERNMENT

Analysis to the Federal Government as a whole has been made to demonstrate the combined effect of the investment and revenues from both agricultural development by FLDA and the provision of infrastructure by other government departments.

The Federal Government capital expenditure for the Triangle as a whole, which includes the capital expenditure of FLDA to bring all projects into production (M$239.9 million) and the capital expenditure of other government departments to provide infrastructure (M$107.6 million), is estimated at M$347.5 million.

Since it is likely that the Federal Government will be the receiving and repaying agency for any external loan, it is important to assess its own repayment capacity. The combined cash flows of FLDA and other government departments are shown in Figure 36. The investment period would be for 11 years from 1966/7 to 1976/7 during which a total of about M$182 million would be required to finance the cash deficit. Requirements for investments for investment would build up steadily to reach a peak of M$32.3 million in 1971/2.

Figure 34



Federal Government would first realise a cash surplus in 1977/8. This would rise to M$24.4 million for the next two years and thereafter rise to a peak of M$39.5 million in 1985/6 before declining as a result of falling f.o.b. prices to the end of the plan period.

The return on capital to Federal Government is 9.1 per cent given the levels of settler income proposed in this report. This represents an adequate margin over expected rates of interest on international, or government borrowing of 6 to 7 per cent. The exclusion of timber taxes reduces the return to 7.8 per cent which provides only a small margin over market rates.

If allowance is taken for a rise or fall of 10 per cent in revenue to FLDA only - no corresponding rise in export duties in assumed - the return to the Federal government would be 11.0 per cent, or 6.9 per cent respectively. This suggests that the repayment capacity of the Federal Government is adequate even in adverse circumstances. The worst situation of 10 per cent lower prices and no revenue from timber tax enables a return of 5.8 per cent to be achieved.

In conclusion, the development of the Triangle appears sound as an object of investment of Federal funds in that it generates ample repayment capacity. It would require a combination of very adverse factors to render it financially unsound. Given expected prices and revenues from timber taxes, Jengka should be able to release funds in addition to repayment commitments, for public investment elsewhere in Malaysia.

FOREIGN EXCHANGE

Fixed capital expenditure required for full Triangle development has a very low foreign exchange content. FLDA's total imports of fixed capital are estimated at M$23.1 million while development of infra-

structure by other government departments would require a further M$30.0 million of imports.

On the other hand the Jengka Triangle would be a large earner of foreign exchange. Total f.o.b. revenue, which is the sum of FLDA revenue plus the value of duties and cesses received by government, rises rapidly from M$1.3 million (1970/1) to M$35.3 million (1975/6). By 1981/2 Jengka would be earning over M$70 million in foreign exchange and would continue in excess of this level till the end of the plan period.

With the small foreign exchange requirements and the large surpluses earned in later years, Jengka becomes a very profitable development on foreign exchange criteria.

FIRST STAGE DEVELOPMENT

An analysis was also made of the repayment capacity of the eastern part of the Triangle (Projects I and II) because it is particularly suited to consideration as a First Stage Development. Expenditure includes an apportioned cost of the Ulu Jempol palm oil mill. It also includes full Triangle headquarters, since development in this area would require Triangle headquarters at the outset. Infrastructure expenditure includes roads and water supply systems for Projects I and II as well as the urban investment in the southeast town.

FLDA's capital expenditure in the First Stage Development would be M$81.4 million; Federal Government's capital expenditure, which includes that of FLDA, would be M$108.8 million.

The investment period for this development would be seven years from 1966/7 to 1972/3. This applies both to FLDA and Federal Government. The total investment by Federal Government would be M$83.3 million to finance the cash flow deficits; to FLDA total investment would be M$65.8 million.

To Federal Government the return on capital would be 6.8 per cent. Although this appears marginal compared to likely market rates, it demonstrates that full Triangle headquarters could be repaid out of the First Stage Development. Repayment of Triangle headquarters in this way would increase the repayment capacity of future second and third stage projects.

To FLDA with full Triangle headquarters, the return on capital would be 7.4 per cent. This represents a small but adequate margin over market rates of interest.

In conclusion, investment in the eastern half of the Triangle in Projects I and II provides a sound first stage undertaking. In addition it provides the framework for development of the rest of the Jengka Triangle at more favourable rates of return since later stage developments would not be burdened with further investment in Triangle headquarters and would have the benefits of revenue from forest exploitation.

EVALUATION AT SOCIAL PRICES

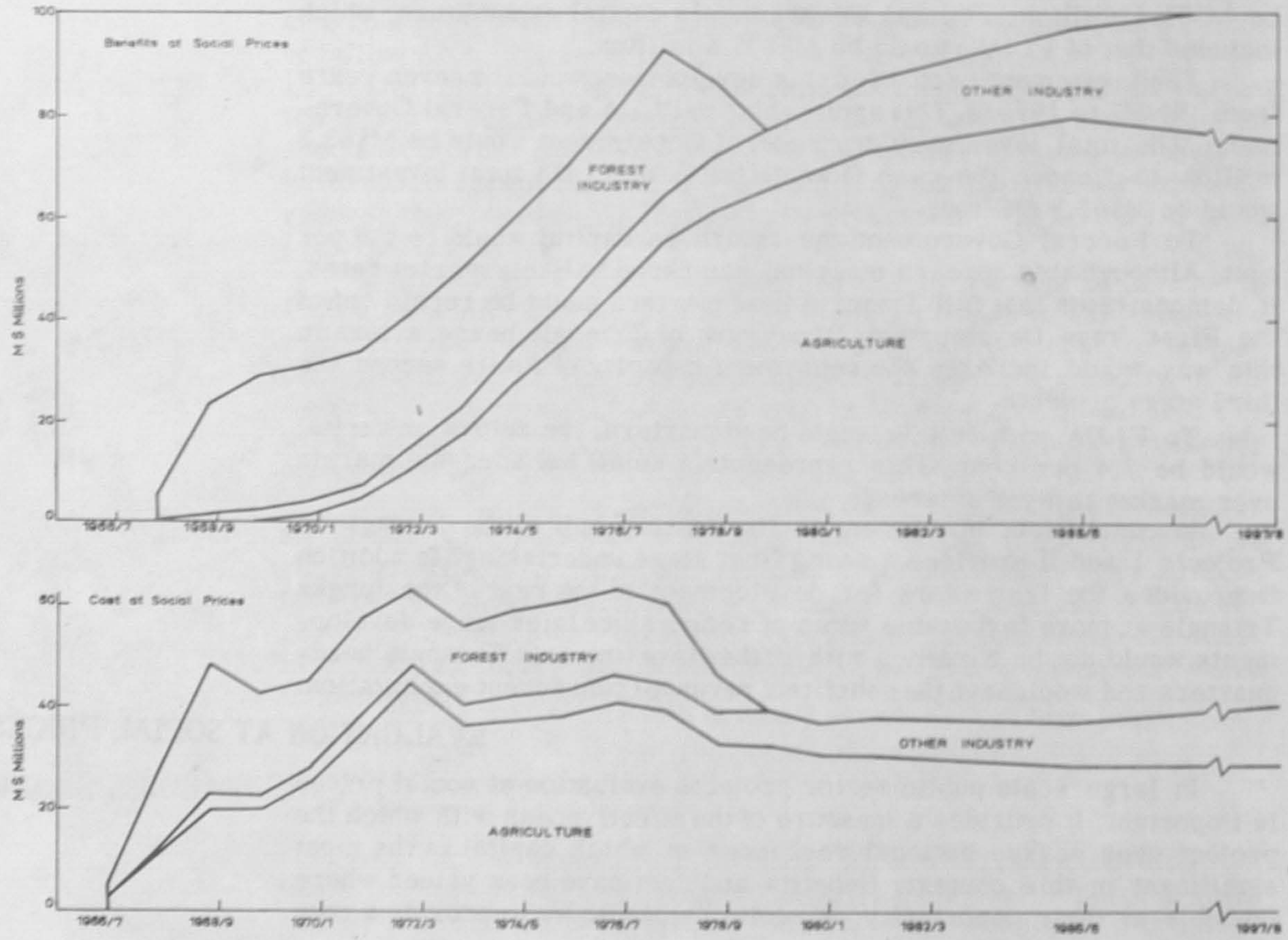
In large scale public sector projects evaluation at social prices is important. It provides a measure of the effectiveness with which the project uses scarce national resources of which capital is the most significant in this context. Benefits and cost have been valued where possible at their opportunity or social values so as to provide a true

measure of the inputs of the project. This analysis concentrates on the return to capital rather than on assessments of benefit-cost criteria. A direct benefit-cost comparison has been excluded from the analysis presented here since the criterion of benefit-cost requires critical assumptions on the opportunity cost of capital. Precise assessment of the true opportunity cost of capital is especially important if benefit-cost criteria are to be used in comparing developments in which widely different time patterns of benefits and cost obtain.

Social Prices

Benefits from agriculture include the f.o.b. value of rubber and oil palm products and the retail values of houselot produce sold (Figure 37). Other benefits comprise the net output of the forest industry after adjusting for internal sales, and benefits from other industry in Jengka. Benefits from other industry were assumed to rise to 50 per cent of the annual level of forest industry benefits by 1981/2 and to equal forest industry annual benefits by the end of the plan period. The investment in other industry was assumed to be equal to that of the forest industry, but distributed over a 23 year period. These assumptions have the effect of raising the return on capital of Jengka (SMP, see below) by about 1.25 per cent.

Figure 35
Benefits and Cost at Social Prices



Cost at social prices (Figure 37) is based on the expenditures at market prices used throughout this report with a number of special adjustments. In assessing the cost of Jengka at social prices all taxes on inputs have been excluded, as have the additional profits made from the increased use of fixed installations such as Port Swettenham. The opportunity cost of settlers' labour has been assumed to be zero in that production in the rural areas is unlikely to be effected by their transfer into Jengka. The opportunity cost of management is clearly higher than its market price. However, it has been assumed that the unskilled and lower echelons of the administrative structure whose opportunity cost is likely to be overvalued at market prices, offset the undervaluation of the higher levels of management.

Return on Capital (SMP)

The return on capital using social prices for the inputs and outputs – often termed the Social Marginal Productivity of capital (SMP) – has been calculated using the discounting process. At expected prices, SMP is about 15 per cent. A 10 per cent variation in f.o.b. prices throughout the period results in a range of SMP from 13.4 per cent to 16.3 per cent. In view of the scale of the project, SMP of 15 per cent indicates a very fair use of capital for economic development.

As in the analysis at market prices, the benefits from forest exploitation are important at social prices. Exclusion of benefits from forest exploitation reduces the expected SMP to 12.2 per cent. This would represent only a marginal use of scarce capital. The importance of efficient forest exploitation must again be emphasised. Clearly some benefit could accrue from organised logging of the type already practised in West Malaysia. This however, will be considerably lower than highly intensive exploitation combined with a timber processing complex.

The inclusion of an additional area to the north in Tekam was also analysed so that the additional benefits of forest exploitation and further regional development in agriculture could be assessed. The analysis was based on a combination of projects in Jengka which reflected the recommended land use pattern in Tekam. Thus the analysis assumed development of projects indentical to Project I and II with equivalent infrastructure, but no town. Development was assumed to start immediately after development of Project VI and a 10 per cent fall in prices from those prevailing in Projects I and II was assumed. Costs and benefits for three full years of forest exploitation were also included. As a marginal addition to the Jengka development, investment in Tekam appeared good, with an SMP of 18.5 – 19.5 per cent. This would cause a small overall rise in the SMP for the whole regional development.

CONCLUSION

Development of Jengka at expected prices with full forest exploitation represents a beneficial use of national resources. It also makes a very good contribution to net foreign exchange earnings. It provides large scale development of new land which in itself is essential to rapid development in West Malaysia in the future. When fully developed it will provide the nucleus for further investments (both public and private sector) in development round its boundaries. The inclusion of Tekam into development complex has very strong economic advantages

and the phasing programme should be reappraised in the light of a decision to develop the area.

Efficient timber exploitation appears so important to development of new land on a large scale as to be a necessity. Future large scale land development should be closely linked to forest exploitation of this type.

The distribution of income from Jengka allows both FLDA and Federal government ample margin for repayment of loans at normal market rates while generating a surplus in the middle of the repayment period. This surplus could be distributed to settlers in the form of higher cash incomes, if warranted by price and cost trends; alternatively it could be used very effectively for financing future developments.

FINANCING

This section assesses the financial requirements and repayment capacities of both FLDA and the Federal Government in implementing full development of Jengka.

The Federal Government would require a loan of M$182.1 million disbursed over 11 years from 1966/7 to 1976/7, until net surplus cash flow would begin (Table 13). Accrued interest over this period would amount to M$727 million charged at 6 per cent and M$827 million charged at 7 per cent. Thus the Federal Government's total investment by mid-1977 would be between M$255 million and M$270 million depending on the rate of interest charged.

Table 13
Financing for Full Triangle Development in M$ Million

	Federal Government (incl. FLDA) Expenditure					FLDA Expenditure only				
		Interest at 6%		Interest at 7%			Interest at 6%		Interest at 7%	
Year	Amount	Interest	Total	Interest	Total	Amount	Interest	Total	Interest	Total
1966/7	2.7	0.1	2.8	0.1	2.8	2.7	0.1	2.8	0.1	2.8
1967/8	11.2	0.5	11.7	0.8	12.0	9.3	0.4	9.7	0.5	9.8
1968/9	19.0	1.4	20.4	1.7	20.7	11.9	1.1	13.0	1.3	13.2
1969/70	18.3	2.6	20.9	3.1	21.4	14.4	2.0	16.4	2.3	16.7
1970/71	23.3	4.0	27.3	4.8	28.1	18.9	3.1	22.0	3.6	22.5
1971/2	32.3	6.0	38.3	7.1	39.4	25.2	4.6	29.8	5.4	30.6
1972/3	31.5	8.2	39.7	9.8	41.3	27.5	6.4	33.9	7.7	35.2
1973/4	19.8	10.3	30.1	12.3	32.1	16.8	8.1	24.9	9.7	26.5
1974/5	15.4	11.9	27.3	14.3	29.7	14.9	9.6	24.5	11.5	26.4
1975/6	7.5	13.3	20.8	16.1	23.6	7.2	10.8	18.0	13.1	20.3
1976/7	1.1	14.4	15.5	17.6	18.7	0.6	11.7	12.3	14.4	15.0
	182.1	72.7		87.7		149.4	57.9		69.6	
Total Loans to 30.6.1977			254.8		269.8			207.3		219.0

FLDA would require a loan (via Federal Government) of M$149.4 million over a similar 11 year period (Table 13). Interest would accrue to M$57.9 million at 6 per cent and M$69.6 million at 7 per cent. This would make FLDA's total investment by mid-1977 between M$207 and M$219 million depending on whether the loan bears a 6 or 7 per cent interest charge.

The commitment of both Federal Government and FLDA to repay the estimated loans is shown in Table 14 for an assumed repayment programme. Loans to both Federal Government and FLDA can be repaid over a 15 year period at either 6 or 7 per cent interest. In both cases three to four years of grace will be required, but in all cases

Table 14
Summary of Assumed Repayment Programme

	Federal Government		FLDA	
	6%	7%	6%	7%
Loan at mid 1977 repayment (1977/8) (M$ million)	254.8	269.8	207.3	219.0
Interest accrued (1977/8) (M$ million)	15.3	18.9	12.4	15.3
Loan at mid 1978	270.1	288.7	219.7	234.3
Grace Periods (years)				
No repayment of interest, or capital	1 (1977/8)	1 (1977/8)	1 (1977/8)	1 (1977/8)
Payment of interest only	2 (1978-1979/80)	3 (1978/9-1980/1)	1 (1978/9)	2 (1978/9-1979/80)
Interest Amount from 1978/9 (M$ Millions)	16.2	20.2	13.2	16.4
Repayment over 15 years				
Equal interest and capital in annual payments (M$ million)	27.8	31.7	22.6	25.8
First year	1980/81	1981/2	1979/80	1980/81
Final year	1994/5	1995/6	1993/4	1994/95

interest can be paid in full except the first year (1977/8). The surpluses available both to Federal Government and FLDA after repayment commitments have been met are adequate to provide not only a margin of safety, but also to release funds for public, or FLDA investment elsewhere.