THE GOVERNMENT OF MALAYSIA
LEMBAGA KEMAJUAN TRENGGANU TENGAH

TRENGGANU TENGAH

REGIONAL PLANNING AND DEVELOPMENT STUDY

VOLUME III

SECTORAL PLANNING GUIDE

HUNTING TECHNICAL SERVICES LIMITED
with
Shankland Cox Partnership

NOVEMBER 1974

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FINAL REPORT

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7. THE DEVELOPMENT OBJECTIVES

7.1 Introduction

The national objectives are set out in the Second Malaysia Plan and restated in the Mid-Term Review. These objectives are embodied in the New Economic Policy (NEP). Two principal aims are covered by the NEP. One is the eradication of poverty through the raising of income and the creation of employment opportunities and the other is the restructuring of Malaysian society to remedy economic imbalance as reflected in the present identification of race with economic function.

It is envisaged that the objective of eradicating poverty should be achieved through an improvement in the social infrastructure and an increase in incomes from employment. The 1970 census indicated greater deprivation in rural areas not only in terms of the low percentage of wage earners per family and low level of total income per person employed but also the poor level of health, nutrition, housing, education and transport facilities.

Lack of social and physical infrastructure thus adds to deprivation in rural areas resulting from intrinsically low cash incomes due to low productivity. This in turn is partly due to poor natural resources such as soils and climate, partly due to the small scale of traditional agriculture and partly due to the absence of access to modern inputs.

The national policy is to encourage higher rural incomes through agricultural schemes organised by national bodies such as FELDA, FELCRA and RISDA. The Farmers' Organisation Authority (FOA) is to be the agency responsible for improving credit and marketing facilities available to small farmers. It will act as the principal agency for raising incomes of small farmers in Malaysia.

It is possible to increase value added in rural areas through the extension of processing activities. The organisations for extending primary processing of agricultural and forest-based commodities include MRDC, FIDA and the SEDC's. The role of all the major authorities is dealt with more fully in Chapter 5.

The restructuring of society involves the eventual correction of racial imbalances in wealth, income and employment. At the present time, ownership of approximately half the acreage of the modern agricultural sector is in the hands of non-Malays.[5] In industry the proportion of fixed assets owned by non-Malays is even higher. These disparities in ownership will be reduced as the proportion of developments in the public sector rises and private enterprise schemes are required to increase the percentage participation of Malays.

The correction of income and employment distortions are closely connected. The employment creation aspect relates to the level of economic growth generally while the widening of job opportunities for Malays depends upon the increasing sophistication of production on the one hand and the increasing supply of skilled labour on the other. Programmes for raising the supply of skilled labour at all levels are

being followed by institutions such as MARA. The objective is to expand the supply of qualified Malays through the industrial training Institute, the vocational institutes and polytechnic.

Income imbalances will gradually be corrected as employment and entrepreneurial activities are spread more evenly throughout the different racial groups in the nation. Organisations such as MARA, PERNAS, UDA and the SEDC's have been instituted for precisely these purposes.

7.2 The Planning Objectives

The basic objectives of the New Economic Policy have been applied to the development planning of Trengganu Tengah. These aims include the generation of income and its better distribution between races and individuals, the creation of employment and the widening of job opportunities. In this chapter those types of land use development thought to be technically feasible are analysed in the light of their achievement of the basic objectives, and each is considered in terms of the return to the scarce factors of labour, land and capital.

In addition to the requirements of the NEP, the Consultants have considered the role of public and private sectors in development. In particular their role is evaluated in terms of their ability to meet these basic goals of policy.

The choice of development strategy requires the adoption of certain assumptions regarding the priority attaching to each major objective. Employment creation options tend to be sub-optimal in relation to per capita income generation. Similarly, a finite plan maximising total value added tends to be capital intensive rather than labour intensive and thus does not satisfy the goals of employment creation.

At some point a decision has to be made regarding the priority of objectives. The method used in this study is to indicate the implications of each major policy objective. The chosen strategy is then derived after considering the implications of each alternative in the light of anticipated conditions throughout the planning period. In the light of changes in probable factor supply and other constraints during the planning period it is not valid to assume an unchanging priority weighting attaching to any given policy objective. For example, given a probable labour scarcity in early years followed by the possibility of an easier labour situation in later years, a strategy may be preferred aimed at income maximisation initially and employment creation at a later stage.

7.3 The Beneficiaries of Development

It is relevant to consider for whom Trengganu Tengah is being developed since the decision on priorities will influence certain major aspects of development. In this study, the development of Trengganu Tengah is presumed to be for the benefit, in descending order, of those people living within the area, those living in adjoining areas of Trengganu State and the East Coast region and more generally for the people of Malaysia as a whole.

Giving priority to those people living within the East Coast region implies a transfer of national resources from other areas to Trengganu Tengah for the benefit of local residents. It further implies measures to ensure that the fruits of this investment are spread fairly and equitably among those working and living within the study area. Regarding the provision of capital it is apparent that central Government financing is a deliberate transfer of national resources to those participating in the development of Trengganu Tengah the cost of which is measured in terms of opportunities for investment foregone elsewhere. Where Federal funds are used, it is essential that efforts are made to ensure that the basic policy aims are met wherever possible.

Where finance originates from the private sector a mixture of incentive and control must be exercised so that the aims of wealth and income distribution among Bumiputras are encouraged while also maintaining the necessary inflow of external capital and expertise. It is considered this may best be achieved through a trust fund in which Bumiputra participation has a controlling interest. In order that private sector interests may be sufficiently encouraged to participate it may be advantageous for the Bumiputra majority interest to be split between two parties. In Trengganu Tengah this could be achieved through SEDC and a Bumiputra trust fund administered by LKTT. This would not give any single entity overall control for management purposes although it would ensure that the majority of the equity was in the hands of Bumiputras. Furthermore, where private capital is involved, a case may be made for maintaining a degree of flexibility in the rate of duties in order to ensure that returns to capital are maintained at an adequate but not excessive level. With oil palm development, in particular, the scope for increasing the export duty is fairly strong in the light of present yield and price estimates. On private schemes the return to capital at present duty levels and allowing for an attractive return to labour will be higher than will be necessary to attract such capital. Greater Bumiputra participation in these returns can either be effected through equity sharing arrangements in the initial investments or by means of higher levies on output.

7.4 The Development Options in Trengganu Tengah

7.4.1 The Limits to Choice

The choice between alternative development strategies is severely limited by major physical and environmental constraints. More than half of the study area is suitable only for forestry. Of the remainder of the area approximately 75 percent is already committed to specific agricultural activities. The scope for developing the uncommitted land is in turn constrained by the peculiar limits of topography and

climate. Steep slopes and high rainfall virtually rule out the possibility of annual crops except in a few areas. For practical planning purposes the alternative major developments are limited to forestry, oil palm, rubber production and their associated secondary industries.

7.4.2 Forestry

Given the basic development objective of maximising income generation it is apparent that timber production is not a realistic alternative on land which is suitable for agriculture. The long rotation required for timber production results in a low return to land compared with most agricultural crops given the current level of prices. Taking an output of 11 tons of timber sold at $90 per ton at the end of a 25 year growing period and excluding any costs to cover establishment and maintenance produces a discounted gross revenue of $58 per acre at 12 percent. Allowing for harvesting costs of $56 per ton the net present value per acre from forestry is $22 when discounted at 12 percent.

By contrast the total return to land over 25 years for oil palm is currently worth $1,227 per acre discounted at 12 percent. Even if timber yields were to reach 20 tons per acre the present value of the net revenue per acre would only amount to $40 when discounted at 12 percent.

The returns to capital from logging and processing operations are, however, attractive. The proposed logging and sawmilling complex produces an internal rate of return, excluding housing costs, of 29 percent over 15 years which is better than that to oil palm production and processing giving 21.5 percent over 25 years.

The return to labour excluding the cost of housing is higher for the combined logging and forestry operations than it is for oil palm production and processing. The return to labour discounted at 12 percent over a 25 year period for the logging and processing operation is $22 per manday compared with $13.80 per manday to oil palm production and processing. This high return reflects the relative capital intensity of the forestry operation and the high value added during harvesting and processing.

Although the returns to capital and labour are attractive the very poor returns to land under existing technology rule out forestry as a practical alternative on land which is suitable for agricultural cropping. On other land in Trengganu Tengah, which is unsuitable for agriculture, the exploitation of existing timber offers substantial returns to capital and labour as mentioned above. The Consultants therefore recommend that value added within Trengganu Tengah should be increased by encouraging the establishment of a new timber processing plant to convert logs harvested in the Dungun Forest Reserve Area. At a later stage further manufacturing may be a possibility but this should be the subject of a detailed feasibility study.

Maximum benefit should be taken from the substantial volumes of timber to be extracted from the agricultural development areas. The additional royalties from this output can provide a small, although welcome, addition to the cash needed to finance the very large public sector development programme in the region.

7.4.3 Agricultural Development Possibilities

Given the long-term needs for the development of agricultural land to meet rising income expectations and a growing population, the full exploitation of agricultural land resources in the region is a major objective. The total area of agricultural land within Trengganu Tengah could be settled over the next 15 years without exhausting the potential labour supply (Chapter 11). In the early years of the development period, however, labour problems may well exist since migration away from the coastal areas may not occur unless the incentives are strong and until an attractive social infrastructure has been built up.

The main strategy in the agricultural sector during the next fifteen years must be to develop estates providing good returns to relatively scarce labour and generating sufficient income to finance the development of viable urban communities offering attractive social amenities to a potential migrant population. Income generation combined with social infrastructural development in the short to medium-term will be the best way to accomplish the longer term objectives of employment creation.

In Chapter 8 the agricultural potential of the region is described in detail, and the technical constraints to crop diversification away from oil palm and rubber are outlined. The only major alternative to rubber and oil palm as an estate development possibility is cocoa, but the existing estates in the region have suffered badly from disease problems, and until these problems have been successfully overcome there is little point in considering cocoa as a major competitor with oil palm and rubber.

In choosing between oil palm and rubber, initial comparisons were made between them in terms of returns to capital, land and labour. These indicated a strong preference for oil palm, which is confirmed by more detailed analysis presented in Sections 15.2.1 and 15.2.2 (Tables 15.7 and 15.13). Oil palm is a considerably more attractive investment with an internal rate of return ranging from 18.0 to 21.5 percent by comparison with 11.0 to 14.9 percent for rubber. Allowing for current rates of duty, the incentives for private capital to establish new rubber estates are very low, with a financial return of only 5.3 percent over 30 years. By comparison, oil palm would yield 16.0 percent to a private investor.

The advantages of oil palm are even more apparent in terms of returns to labour and land. The net present value per acre developed from oil palm is $1,873 over 25 years, allowing a return to labour of $6 per day and a return to capital of 10 percent. The equivalent return from rubber over 30 years is $130 per acre. At 12 percent return to capital, the return to land from rubber becomes negative, while it remains above $1,000 per acre for oil palm. The annual equivalent returns to land are $206 per acre per year at 10 percent and $156 per acre per year at 12 percent for oil palm, compared with equivalent returns of $13 and negative from rubber.

Not surprisingly, since rubber is more labour intensive than oil palm the available returns to labour are widely different for the two crops. Before duties, and allowing 12 percent return to capital, oil palm offers a theoretical return to labour of $13.80 per manday over 25 years. The comparable figure for rubber is $5.53.

In the light of these returns, there is little doubt that the major development effort should go into oil palm. Some new rubber has been planted by SEDC at Bukit Besi since 1970, and further development has been planned by the Consultants but only in those areas of the region where topography limits the suitability of the land for oil palm.

7.5 Settlement Pattern

It is important to stress that Trengganu Tengah is being developed for the benefit of people. Development will affect those working and living within the area, in the State of Trengganu and to a lesser extent in other parts of Malaysia. In assessing the value of alternative development strategies, it is entirely relevant to consider, albeit briefly, the effect of certain actions and developments on the life styles of those living within the region.

It is generally agreed that isolated small settlements in rural areas do not offer the facilities of larger urban communities. The larger the scale of urban settlement the greater the range of social amenities that can be economically provided. Thus the creation of towns of a certain minimum size in rural areas such as Trengganu Tengah enables the provision of a wider range of services than previously available. The wider availability of education, health and social services enables a change in life styles whose benefit is not readily apparent from simple value added calculations. This theme is developed more fully in Chapter 12.

Of the basic alternative strategies for development, those which contribute most to changing people's life styles are those which offer the greatest scope for employment in further processing and manufacture at a central location.

The resulting community is able to provide adequate schooling, health facilities, shops, power, communities and other facilities considered essential in the modern world. The larger the community the greater the range of supporting services and thus the wider the range of jobs available which is itself considered by many to be a benefit. Provided these changes can be accommodated without compensating social deprivation, such as the breakdown of the extended family, then the social gains can be considerable.

The aims of diversifying job opportunities and improving social amenities require settlements of a reasonable size based upon primary and secondary processing activities. In this respect, timber processing and manufacture and oil palm processing appear to offer more scope than rubber in generating both jobs and income.

7.6 Conclusions

The recommended strategy for development is based on rapid development of oil palm estates and forest processing producing relatively high income and widening the employment base during the next decade. Concurrent with this basic policy should be the tactical decision to withhold certain areas of agriculturally suitable land

for development until after 1980. This would reduce immediate pressure on a relatively tight short term labour market, give time for results to emerge from pilot projects on agricultural diversification and introduce some needed flexibility into the planning of the region. The existence of certain uncommitted areas of land would also act as an incentive for pilot projects, to the extent that operators of successful field projects might qualify for portions of these uncommitted areas.

A feature of the recommended strategy is the necessity of ensuring that the greatest possible degree of processing is carried out within the region.

CHAPTER 8

Proposed Agricultural Development

8. PROPOSED AGRICULTURAL DEVELOPMENT

8.1 Agricultural Policy

On the national level, the guidelines used in formulating the policy of agriculture follow closely the aims of the New Economic Policy. Thus the national policy for agriculture as stated in the Second Five Year plan is aimed primarily at the reduction of unemployment and under-employment and the raising of living standards in rural areas by the creation of job opportunities in modernised, high productivity agriculture. The NEP also aims to reduce the economic imbalances between Malays and non-Malays and between different regions of the country. One of the policy objectives is to give Malays a more equitable share in all modern sectors of the economy including high productivity agriculture. Development effort is to be directed particularly to regions which are lagging behind the national average in prosperity. The east coast of Peninsular Malaysia in general and Trengganu State in particular is an area which is presently well below the national average in terms of per capita income. It is also an area where the majority of the population are Malays. The concentration of development effort in the east coast region is directed to correcting these regional and racial economic imbalances.

The increasing proportion of land developed for settlement schemes and the entry of public sector agencies into estate type developments has, as its basic aim, the promotion of Bumiputra participation at all levels in the rural economy. The Federal and State Agricultural Departments and the public sector agencies concerned with replanting of rubber and other crops and the provision of technical advice, credit and marketing facilities are principally concerned with raising rural incomes on existing smallholdings. While most of the past development and that proposed for the immediate future is based on the traditional crops of Malaysia especially rubber, oil palms and padi, the aim of the Government is to reduce reliance on this narrow range of crops by diversifying agricultural activity into other crops and livestock. The realisation of this policy will require a considerable intensification of the agricultural research effort and the training of personnel to establish and maintain the new crops once commercial projects are formulated. MARDI has been set up to plan and execute the research programmes for most crops, livestock and fisheries; the training of agriculturalists is being dealt with by the newly established University of Agriculture and at Agricultural Training Centres throughout the country.

The private sector, particularly those agencies which have been long established in the agricultural industry, also makes a valuable contribution both to research into traditional and diversified crops as well as in the training of personnel at all levels of technical and managerial expertise. This sector plays and will continue to play an important role in providing experience and capital to develop agricultural projects based on traditional and new crops. Bumiputra participation will be ensured by existing and proposed legislation to allocate a proportion of the equity of such projects to the Malays and other indigenous people.

In translating the national policies into an agricultural plan for Trengganu Tengah, the Consultants have followed the directives of their Terms of Reference with regard to meeting the objectives of the New Economic Policy especially those aspects

concerning maximisation of employment opportunities for Malays and raising the general level of rural incomes. The Government's policy for diversifying agriculture has also received close attention and, having regard to the technical and economic constraints of the area, the Consultants have indicated a range of crops which, after further research, show promise as a basis for commercial development.

The early part of the planning period until 1980 will be occupied with the immediate implementation of projects which can be developed on a commercial scale without further investigation. These projects, which are mainly based on oil palms or rubber will create, over the next five years, several thousand job opportunities in the modern agricultural sector. For the most part, ownership and control of these projects will be in the hands of public sector agencies or Bumiputra entrepreneurial groups. Also during this period there will be an intensified research effort aimed at producing efficient information on the opportunities for various diversified crops which can be used as a basis for commercial scale projects starting in the 1980's. At the same time the Consultants have proposed a number of pilot projects for immediate implementation which could lead to commercial developments during the second decade. The pace of the proposed development meets the need for the rapid increase in employment opportunities and the raising of basic incomes called for in the NEP. It also takes into account the need to maximise the economic benefits of exploiting the existing forest resource, by phasing the agricultural development to coincide with a reasonable rate of timber extraction from the areas to be cleared.

The prime responsibility for realising these objectives and for implementing them in terms of project development lies with the Trengganu Tengah Development Authority (LKTT).

8.2 Land Resources

8.2.1 The Available Land

From planimeter measurement the gross area of land with some potential for agricultural development (i.e. in Soil Suitability Classes, 1 – 4) is 524,068 acres (Table 4.4). Existing and sited committed developments including small scale alienations already account for 241,398 acres (Section 6.1). Thus, by subtraction there is a balance of land with some potential for agricultural development 282,670 acres (Table 8.1).

The Consultants have examined this land from the point of view of soil type, terrain, its location in relation to existing and committed project boundaries and forest reserve areas. Bearing these factors in mind, a Development Capability Classification has been prepared.

Table 8.1 Acreage of Land in Trengganu Tengah with Agricultural Potential

			Acres
Committed	1.	Existing projects (Table 6.1)	96,688
	2.	Sited committed projects (Table 6.4)	84,710
	3.	Other alienations for agriculture	60,000
		Sub-total	241,398
Uncommitted	=	Balance for planning purposes	282,670
TOTAL (Table 4.4)			524,068

8.2.2 Development Capability Classification of Land with Potential for Agricultural Development in Trengganu Tengah

Class A – Areas with predominantly Class 2G[(i)] soils but which may also contain 1G, 2d and 3G soils and smaller areas of other less good soils. The 2d soils may require drainage before they are suitable for perennial crops, and 3G soils will require soil conservation measures such as terraces or platforms. These areas are suitable for the planting of oil palms, rubber, coconuts and most fruit crops. Some are also suitable for cocoa where only 1G or 2G soils are involved. Limited areas, where the slope is less than 6^{o}, could be considered for the planting of annual food crops.

Class B – Areas with predominantly Class 3G soils but which may include small areas of 2G and 2d soils. Soil conservation measures will be necessary, which will add to development costs. These areas are suitable for rubber and some fruit crops such as citrus, mangosteen and ciku.

Class C – Areas with mostly 2d soils but some small patches of 2G soils. Such areas are fertile but liable to seasonal flooding and usually have a high water table at most times. These areas are often planted to padi but could be used for production of annual cash crops and vegetables during the dry season. They are mostly located in small lots along river valleys and it is recommended that they be reserved for small-holder alienation for the seasonal cultivation of food crops.

Class D – Areas with 3d soils which are waterlogged throughout the year. They are inland swamps which, without costly drainage schemes, have very limited potential for agriculture. Padi can be grown if a suitable irrigation and drainage network is constructed. Otherwise these areas are only suitable for the growing of sago palm.

(i) Description of these soil classes is given in the Soil Suitability Classification for Trengganu Tengah (Appendix D).

Class E – Areas with 3cG soils which have an impeded profile. This land has limited potential for agriculture and cannot be recommended at present for planting with any crop. It is suggested that it should be left undeveloped pending further investigation during the semi-detailed soil survey now in progress.

Other areas – These include isolated pockets of land in soil Classes 1–3 which are too small or too isolated to be considered for development purposes, the peat swamps in soil Class 4do, the shallow profile soils on hilly terrain classified as 4Gc and the steep land classified a 5STP. None of these areas is considered suitable for agricultural development.

The deep peat swamps would require extensive drainage work to render them suitable for agricultural use. This could only be justified after a special study of the economics of utilising the deep peat swamps in the national context. The 4Gc soils have limited potential for agriculture of any kind and it has already been recommended that they should be left under forest. Most areas of the soil in this class in Trengganu Tengah are already in the forest reserves in Jerangau and Bukit Bauk. The steep land, 5STP, is unsuitable for agriculture because of excessive slope. Most of this land is already in forest reserves or projected forest reserves.

A number of areas of steep land occur as islands inside areas otherwise suitable for agriculture. The State Forest Department has indicated that it is prepared to administer such areas as forest reserves providing they are not less than about 1,000 acres. Smaller areas should be left permanently under forest as amenity reserves and the Forest Department might administer some of them if suitable access is provided.

The acreage of these land classes is shown in Table 8.2.

Table 8.2 Development Capability Classification in Trengganu Tengah

Class	Soil Classes	Area (Acres)	Crop Suitability
A	1G, 2G, 2d, 3G	110,837	Oil palms, rubber, coconuts, cocoa, fruit trees, annual crops, vegetables.
B	3G, 2d, 2G	38,220	Rubber, citrus, mangosteen, ciku.
C	2d, 2G	27,621	Rice, annual crops, vegetables.
D	3d	33,206	Sago palm.
E	3cG	5,050	Marginal for agriculture.
Sub-total		214,934	Total unoccupied land with some agricultural potential.
Other	4do, 4Gc, 5h, 5STP	642,508	Mostly suitable for forestry (Table 8.3)
Sited projects and alienated land (Table 8.1)		241,398	
Total area, Trengganu Tengah		1,098,840	

From Table 8.2 it can be seen that there are 214,934 acres of land still unoccupied which have some potential for agricultural development. The location of the various Development Potential Classes is shown in Fig. 8.1, and the land areas in Classes A and B, which are the areas with greatest potential have been identified by number. These areas are listed in Table 8.4.

The area of land classified as being mainly suitable for forestry (Table 8.2) exceeds the calculated area of land in Soil Suitability Classes 5h and 5STP by 69,736 acres. This is accounted for in Table 8.3 below.

Table 8.3 Land Considered Unsuitable for Agricultural Development

Soil Class	Acres
Classes 1–3[1]	19,201
4do	12,749
4Gc	37,786
5h 5STP (Table 4.4)	572,772
TOTAL	642,508

[1] Land in isolated, inaccessible pockets.

Table 8.4 Land in Development Capability Classes A and B

Area[3] Number	Gross area Class A	Gross area Class B	Net plantable[1] area in Class A and B
			Acres[2]
1	1,024		768
2	908		681
3	512		384
4	1,344		1,008
5	5,248		3,936
6	1,760		1,320
7	1,536		1,152
8	12,819		9,614
9	1,250		938
10	7,712		5,784
11	992		744
12	2,771		2,078
13	7,800		5,850
14	1,670		1,253
15		2,208	1,656
16	10,406		7,805
17	10,419		7,814
18		1,107	830
19	6,445		4,834
20		1,920	1,440
21		8,345	6,259
22		3,140	2,355
23	7,386		5,540
24	7,962		5,972
25	6,778		5,084
26	1,645		1,234
27	832		624
28	313		235
29	2,054		1,541
30	3,411		2,558
31	840		630
32		21,500	16,125
33	5,000		3,750
TOTAL	110,839	38,220	111,796

(1) Net = Gross X 0.75

(2) Planimeter measurement

(3) See Fig. 8.1

CLASSIFICATION

NO EXISTING and PROPOSED PROJECTS

NO AGRICULTURAL POTENTIAL

ALIENATED LAND

POTENTIAL LEAST — GREATEST

A B C D E

AGRICULTURAL DEVELOPMENT POTENTIAL

0 1 2 5 10miles

FIG. 8.1

8.3 Agricultural Planning Details – Oil Palm and Rubber

8.3.1 Introduction

Development of agriculture in Trengganu Tengah is being and will continue to be based on the planting of oil palms and, to a lesser extent, rubber. The prospects for crop diversification have been discussed in some detail during the course of the study and are summarised in Section 8.5 of this chapter. Broadly speaking there are limited opportunities to develop coconuts, cocoa, fruit trees and possibly cattle on a commercial scale during the second development decade (1980 – 1990). However, such developments will depend on the results of an intensive research programme which should be started at once.

In view of the limited crop diversification possibilities, by far the greater part of the present agricultural planning, effort has been concentrated on the two main crops, oil palm and rubber, and this Section sets out the main agricultural planning criteria for these two crops with regard to yields, management, labour and processing. Section 8.4 discusses the market prospects for rubber and oil palm. More detailed economic analysis of the proposed agricultural developments will be found in Chapter 15. The investment programme for crop processing is analysed in Chapter 10.

8.3.2 Definition of Management Systems

Agricultural development projects can be classified according to type and size.

(a) Estates – by legal definition an estate is an area of 100 acres or more under one management. In Trengganu Tengah most estate projects occupy at least 1,000 acres and some up to 25,000 acres. Estates are common to both private and public sector ownership and management. While well managed estates represent the most efficient method of developing and producing many tropical crops, especially those that require elaborate on the spot processing, estates do not always meet the sort of socio-economic objectives established in the New Economic Policy.

(b) Settlement Schemes – Until recently this type of scheme has been unique to FELDA, a public sector agency. Recently, however, FELCRA has come into this field with its Youth Schemes. Settlement schemes have been used in Malaysia to settle landless people and give them a recognisable stake in the production of oil palm which had hitherto been the exclusive province of the estates. Settlement schemes based on rubber have given the smallholder settler a chance to start work on a well-prepared holding, planted with the best known clones and with access to sophisticated processing facilities to maximise the market value of his product. Other crops such as sugar cane and cocoa have been introduced to this system recently but it is too early to judge the success of this development.

(c) Smallholdings – This category covers holdings of 99.9 acres or less. There are many such farms in Trengganu Tengah mostly of 10 acres or less covering an estimated 60,000 acres. They are mainly growing rubber or seasonal padi. Levels of production are low. This type of holding satisfies the desire for property ownership but it has typically been associated in the past with subsistence levels of agriculture. Over the last twenty years great efforts have been made to raise the standards of smallholder

farming and agencies such as RISDA, the FOA's and the State Departments of Agriculture have done much in their particular fields. Much remains to be done in Trengganu Tengah in this connection. The Controlled and Fringe Alienation Schemes of the late 1960's were varied in their success and these areas in Trengganu Tengah are not very productive.

Efficient production by smallholders requires some central guidance in the form of technical advice, credit, and marketing facilities. Production of padi requires the building of irrigation schemes to control drainage and flooding. The opportunities for this in Trengganu Tengah are very limited. If centralised processing facilities for oil palm and rubber become available smallholder growers could become more involved in the production of these crops.

However, it is in the production of annual crops such as maize, groundnuts and vegetables and in the initial supply of these crops and fruits to the local market that the smallholder will play his most important role. To achieve this the existing agencies will have to intensify their efforts in extension, provision of credit and marketing facilities. Further alienation of land for smallholdings is not recommended until the proposed settlement pattern starts to be established and the need for smallholdings near the new settlements is clear. The land with Development Capability Class C is recommended specifically for this type of development.

8.3.3 Oil Palm Planning Details

Agronomy

There are inherent constraints to the successful growing of oil palms in Trengganu Tengah. These are: lack of first class soils, generally steep topography, below optimum sunlight hours during the monsoon period and heavy seasonal rainfall. The last interrupts pollination and can give rise to transportation difficulties during the monsoon period which coincides with the peak cropping season. In spite of these factors oil palm is already widely grown in the area and most of the current developments are based on this crop.

Yields

The Consultants believe that yields of oil palm in Trengganu Tengah will always be lower than the best yields obtainable in Peninsular Malaysia for the reasons given above. All the authorities consulted have confirmed this viewpoint. Yield projections (Table 8.5) are conservative for the reasons stated. So far there are no oil palm plantings in Trengganu Tengah with a long enough life to provide actual figures over a long period. However, even at lower projected yields and on a conservative price projection (see Section 8.4) compared with the high price levels during the first months of 1974, oil palm is still an attractive crop for redevelopment.

In Trengganu, felling usually starts in October and planting is generally completed by the following October. Oil palms start to come into production 36 months after planting and thus the harvesting period of Year 4 is only about three months. The first full calendar year of production corresponds to Year 5. The Pahang

and Johor figures are used for comparison only, and the peak yields of 10 tons in these projections take into account the more favourable soil and climatic conditions in those states. The actual yields from the two FELDA schemes are of limited value and the drop in yield shown in these two examples was caused by external factors (loss of harvesting days due to labour troubles) and should not be interpreted as the fall following a peak. The seasonal fluctuations in crop yield are considered to be more extreme in Trengganu than elsewhere in Malaysia. In the absence of actual yield figures from areas fully in production it is not possible to predict accurately what would be the maximum percentage of the annual crop likely to be harvested in any one month but local opinion suggests that in the peak month as much as 15 percent of the year's crop may be harvested. This figure is used in projecting milling capacity needs.

Table 8.5 Oil Palm Yield Projections (Tons ffb/Acre)

Year	Estimate used by Consultants	Sungei Tong O.P. Estate NEDECO Study	Pahang Tenggara Study[3]	Johor Study[4]	Actual Yields	
					Bukit Bading Phase I	Jerangau Phase I
0[1]	–	–	–	–	–	–
1[2]	–	–	–	–	–	–
2	–	–	–	–	–	–
3	–	–	–	–	0.3	–
4	0.3	3.0	0.53	2.0	1.41	0.48
5	2.4	5.1	3.79	5.5	3.75	3.49
6	6.0	7.2	6.63	7.0	7.8	5.91
7	7.8	8.1	9.47	8.5	9.3	5.16
8	9.3	8.7	9.47	10.0	8.3	8.07
9	9.0	8.9	9.47	10.0		9.52
10	9.0	9.0	10.0	10.0		7.15
11	9.0	8.9	10.0	10.0		
12	9.0	8.8	10.0	10.0		
13	9.0	8.6	10.0	10.0		
14	9.0	8.4	10.0	10.0		
15	9.0	8.2	10.0	10.0		
16	8.0	8.0	10.0	9.8		
17	8.0	7.8	10.0	9.6		
18	8.0	7.6	8.21	9.4		
19	8.0	7.4	8.21	9.2		
20	8.0	7.2	8.21	9.0		
21	7.0	7.0	8.21	8.9		
22	7.0	6.8	8.21	8.8		
23	7.0	6.5	8.21	8.7		
24	7.0	6.2	8.21	8.6		
25	7.0	6.0	8.21	8.5		

[1] Year 0 is the calendar year in which felling is started.
[2] Year 1 is the calendar year of planting.
[3] Pahang Tenggara Study[1]
[4] Johor Tenggara Study[6]

Management and Labour on Oil Palm Estates

In planning oil palm developments the Consultants have estimated that 75 percent of the perimeter acreage of an area can be considered as planted area. This allows for exclusion of unsuitable soils and terrain and the area occupied by roads and building sites. Thus the oil palm estates (OPE – 1 etc.) proposed by the Consultants, which have a gross area of 6,700 acres, will have a planted area of 5,000 acres. From a management point of view there is little economy of scale between a 5,000 and a 10,000 acre estate. It is only when processing is considered that the acreage necessary to support an economic size of mill becomes of importance. The Consultants proposals for processing are dealt with briefly in this chapter and in more detail in Chapter 10.

A 5,000 acre estate can be run in two divisions each with an Assistant Manager responsible to the Estate Manager. It is suggested that each area is developed in three phases, the first of which is 1,000 (planted) acres and the second and third phases 2,000 (planted) acres each. The size of estate proposed should ensure concentration of management at an early stage with consequent high standards of planting and maintenance in the development period.

Mid-level supervisory staff on oil palm estates (i.e. conductors) are estimated at one conductor per 1,000 (planted) acres. Office staff for a 5,000 (planted) acre estate are estimated at two clerks and one typist.

Based on their previous projection[134] of manpower requirements the Consultants have prepared an estimate of the labour requirements for oil palm in mandays/acre (Table 8.6) and the actual labour requirement for a 5,000 (planted) acre estate (Table 8.7).

The figures in Table 8.7 are derived from Table 8.6 assuming that there are 300 working days in each year, except year 0 which (being only three months Oct. – Dec.) is assumed to have 75 working days.

It has been assumed that all the operations of crop establishment are carried out by contractors and that contractors will also carry out fertilising and weed and pest control until the end of Year 2. Thus contractor's labour leaves each phase at the end of Year 3 and thereafter all labour is directly employed.

It will be seen that there is a peak demand for direct labour in Year 5 of each Phase and in Year 7 of the estate development programme. This is due to rapid increase in labour for harvesting combined with high weeding and pollination labour requirements in young mature palms. Thereafter, the labour demand declines to around 300 workers in Year 11. It is assumed that the early peak demand will be met by casual labour, either from the families of estate workers or from neighbouring kampungs. Much of the work during the early years of oil palms, such as weeding and pollinating, is suitable for juveniles or females.

Table 8.6 Oil Palm Estate Labour Requirements (Man days per planted acre)

Year	0	1	2	3	4	5	6	7	8	9–25	16–30
Establishment											
Survey and land clearing	4.0	9.0									
Weed control after land clearing		0.3									
Cover crop establishment and maintenance		3.5									
Lining, platforming, holing and planting		12.0	0.2								
Inspection and harvesting paths	0.7	0.5	0.7	1.5							
Road construction	0.3	1.0		2.5							
Drainage	0.1	0.4	0.6								
Nursery preparation and operation[1]	1.4	1.6									
Village site clearing			0.3								
Sub-total	6.5	28.3	1.8	4.0							
	CONTRACT LABOUR ←				→ DIRECT LABOUR/SETTLERS						
Maintenance											
Fertilizing		0.2	0.6	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Weed and pest control		5.0	10.2	7.2	4.6	4.6	1.5	1.5	1.5	1.7	1.7
Pruning				2.0	1.7	2.4	1.7	1.7	1.7	2.4	3.0
Collecting and applying pollen				2.6	6.3	6.2	5.4	4.5	3.6		
Harvesting and loading					1.3	7.7	10.3	11.0	11.0	12.1	13.8
Road and drain maintenance		0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Harvesting paths maintenance					1.8	1.3	0.7	0.7	0.2	0.2	0.2
Sub-total		5.3	11.1	13.0	16.9	23.4	20.8	20.6	19.2	17.6	19.9
TOTAL FIELD LABOUR INPUTS	6.5	33.6	12.9	17.0	16.9	23.4	20.8	20.6	19.2	17.6	19.9

(1) Labour for nursery preparation and operation average out over planted area.

Table 8.7 Manpower Requirement for 5,000 (Planted) acre Oil Palm Estate (Mandays)

LABOUR													STAFF			
Phase I 1,000 acres			Phase II 2,000 acres			Phase III 2,000 acres			Total 5,000 acres							
Year	Con[1]	Dir[2]	Year	Con	Dir	Year	Con	Dir	Year	Con	Dir	Total	Man[3]	Sup[4]	Cle[5]	Total
0	87	–	–	–	–	–	–	–	0	87	–	87	2	1	1	4
1	112	–	0	173	–	–	–	–	1	285	–	285	2	3	2	7
2	43	–	1	224	–	0	173	–	2	440	–	440	3	5	3	11
3	14	43	2	86	–	1	224	–	3	234	43	367	3	5	3	11
4	–	56	3	26	87	2	86	–	4	112	143	255	3	5	3	11
5		78	4	–	113	3	26	87	5	26	278	304	3	5	3	11
6		69	5		156	4	–	113	6	–	338	338	3	5	3	11
7		69	6		139	5		156	7	–	364	364	3	5	3	11
8		64	7		137	6		139	8	–	340	340	3	5	3	11
9		59	8		128	7		137	9		324	324	3	5	3	11
10		59	9		117	8		128	10		304	304	3	5	3	11
11/15		59	10/14		117	9/13		117	11/15		293	293	3	5	3	11
16		66	15		117	14		117	16		300	300	3	5	3	11
17		66	16		133	15		117	17		316	316	3	5	3	11
18/30		66	17/30		133	16/30		133	18/30		332	332	3	5	3	11

(1) Con = Contractor's Labour
(2) Dir = Direct Labour
(3) Man - Managerial Staff
(4) Sup = Supervisory staff (Conductor)
(5) Cle = Clerical Staff

Management and Labour on Oil Palm Settlement Schemes

The requirements for management on settlement schemes, which are mostly run by FELDA, have to take into account the additional supervision required for the settlers. FELDA has now standardised its staff establishment according to scheme size and this is shown in Table 8.8.

On FELDA oil palm settlement schemes, the settlers come in at Year 3, a year before the trees begin to come into bearing. During their first year the settlers learn to maintain the crop and start pollination and other maintenance operations. Up to that time the development and maintenance of the crop is done by contractor's labour. Although each scheme has its peculiarities, the typical manpower requirements of a FELDA scheme of 15,000 (planted) acres developed in three phases (i.e. FELDA Rasau – Kerteh) is shown in Table 8.9. Settler population is based on the new standard of 14 acres of oil palm per family.

It is assumed that the peak requirements for labour caused by rapid increase in crop from Year 5 to Year 8 combined with the need for weeding and pollination, will be met by labour from the settler's family.

Table 8.8 Staff and Direct Labour Establishment on FELDA settlement schemes

Position	Number per unit	Year of appointment
Managerial		
Manager	1 per scheme	Year 0
Assistant Manager	1 per scheme (3,500 acres minimum)	Year 3
Supervisory		
Supervisor	1 per 1,500 acres	Year 0
Field Assistant	1 per 500 acres	Year 0
Settler Development Assistant	1 per 400 families	Year 3
Clerical		
Clerks	3 per scheme	Year 0 (1 clerk) Year 1 (2 clerks)
Typist	1 per scheme	Year 3
Direct labour		
Drivers – Land Rover	2 per 2,000 acres	Year 0 and 3
Tractor	2 per 2,000 acres	Year 0 and 3

Source: FELDA Headquarters, Kuala Lumpur.

Table 8.9 Manpower Requirement for 15,000 (Planted) Acre FELDA Oil Palm Settlement Schemes

CONTRACT LABOUR AND SETTLERS												FELDA EMPLOYEES					
Phase I 5,000 acres			Phase II 5,000 acres			Phase III 5,000 acres			Total 15,000 acres								
Year	Con[1]	Set[2]	Year	Con	Set	Year	Con	Set	Year	Con	Set	Total	Man[3]	Sup[4]	Cle[5]	Dri[6]	Total
0	435	–	–	–	–	–	–	–	0	435	–	435	2	13	1	2	18
1	560	–	0	435	–	–	–	–	1	995	–	995	3	26	3	4	36
2	215	–	1	560	–	0	435	–	2	1210	–	1210	4	30	3	8	45
3	70	357	2	215	–	1	560	–	3	845	357	1202	4	31	4	8	47
4	–	357	3	70	357	2	215	–	4	285	714	999	4	32	4	8	48
5	–	357	4	–	357	3	70	357	5	70	1071	1141	4	33	4	8	49
6/30	–	357	5/30	–	357	4/30	–	357	6/30	–	1071	1071	4	33	4	8	49

(1) Con = Contractor's labour
(2) Set = Settlers
(3) Man = Managerial staff
(4) Sup = Supervisory staff
(5) Cle = Clerical staff
(6) Dri = Drivers

Oil Palm Processing

Since oil palm is to be the principal crop in Trengganu Tengah, the organisation and siting of the processing mills is an important factor. The present arrangement is for each estate or settlement scheme to have its own mill or to mill at a company group mill. Although small palm oil mills are technically feasible it is generally considered that a mill capacity of 20 tons/hour ffb is the minimum desirable unit. At least 7,000 planted acres is required to support a 20 ton/hour ffb mill under West Coast conditions and possibly 8,000 acres under Trengganu conditions (because of lower yields in Trengganu). There are obvious economies of scale as the mill size is increased, the main limiting factors being the distance from the field to the mill and the organisation of ffb deliveries from large areas to minimise reduction in oil quality.

Present practice on most estates is to build a mill on the spot, because experience has shown that the prices for ffb paid by outside mills are not favourable to the producer. This means either that oil palm areas must be a certain minimum size or that uneconomic small mills are built which seldom utilize their potential capacity. The Consultants' recommendation for Trengganu Tengah is that central palm oil mills should be built to serve all the oil palm projects within a given area.

To date, there are only two mills in the area (FELDA Jerangau and NADEFINCO) and there is still a chance to establish a centralised milling system, the principal advantages of which would be:

(i) Lower capital cost per unit of milling capacity.

(ii) Better use of peak capacity.

(iii) Greater flexibility of estate size.

(iv) Better availability of processing facilities to small holder growers.

(v) The creation of an industrial base in the proposed settlement centres.

(vi) A supply of surplus electric power to the settlement centres.

(vii) Centralised pollution control.

(viii) Better prospects for further processing (e.g. refining).

Certain disadvantages may be seen among which are:

(i) Possible increased transport costs from field to mill.

(ii) Difficulty of organising several suppliers of ffb to coordinate with the mill throughput.

(iii) Greater propensity to stoppage through mechanical failure or industrial strife.

The Consultants feel that the advantages far outweigh the disadvantages which should not be difficult to overcome. The extensive public road system proposed for Trengganu Tengah should enable use to be made of larger transportation units which would redue transport costs. The early years of production would be on a gradually

increasing scale, thus enabling administrative experience to be built up before peak production was reached. Furthermore, it would reduce the potential constraint to development posed by the shortage of qualified managerial and skilled technical staff for palm oil mills.

Ownership and control of the central mills should be in the hands of the schemes and estates involved and equity could also be made available to estate workers and FELDA settlers. Thus more value added would accrue to the prime producer. Large mills in the hands of one owner are not likely to be acceptable to the suppliers of ffb. LKTT should take a share holding and play a promotional and coordinating role to ensure the implementation and success of this development.

The siting, phasing and economics of palm oil mills have been dealt with in detail in Chapter 10. The planning of the size and phasing of the mills have been based on the following assumptions:

(i) Mill capacity is related to the unit of capacity of screw presses (i.e. 10 tons/hour per unit).

(ii) In normal circumstances a two shift operation will be worked with a third shift during peak crop periods giving a maximum of 20 hours/day milling time. There will be 25 milling days per month.

(iii) In Trengganu Tengah, peak annual crop will average 9.0 tons ffb per acre and peak monthly crop (Nov. – Dec.) will be 15 percent of total annual crop (i.e. 1.135 tons/acre).

Using these assumptions it is calculated that at peak annual production every 1,000 acres of oil palms will require 2.7 tons/hour milling capacity.

8.3.4 Rubber

Rubber is the second most important crop in Trengganu Tengah in terms of area. At present large scale developments are limited to two estate areas (Jabor Valley Estate and SEDC, Bukit Besi) and one settlement scheme (FELDA, Seberang Tayor). FELDA have indicated that they are not prepared to start any more settlement schemes in Trengganu based on rubber. However, the Consultants have identified several areas of land which contain soils more suitable for rubber planting than for oil palm, and it is recommended that these areas be considered for future development.

Agronomy

The principal limiting factor to successful rubber production in Trengganu Tengah is the high rainfall in the monsoon season which also coincides with the peak cropping period. However, lost tapping days and washouts at this time can be compensated for by recovery tapping systems. With good management, yields could be obtained which are nearly as high as those in other parts of Malaysia.

Yields

After a number of consultations with people on the spot and in other parts of the country, yield projections have been made and are shown in Table 8.10. The use of the stimulant "Ethrel" from Year 16 onwards is assumed to be standard practice, although there is considerable controversy about the actual increases in yield it produces.

Management and Manpower on Rubber Estates

Rubber requires more supervision than oil palm and makes use of far more labour per unit area. An estate of 4,000 (planted) acres would require one Manager, two Assistant Managers and eight Conductors (i.e. one per 500 acres). Clerical staff are the same as for oil palm (i.e. two clerks and one typist for a 4,000 acre estate).

Table 8.10 Rubber Yield Projections (lb. drc/acre)

Year	Estimates used by Consultants	Pahang Tenggara Study[1]	Johor Study[2]
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
6	0	0	0
7	620	630	620
8	1,010	900	1,010
9	1,260	1,170	1,260
10	1,420	1,350	1,420
11	1,500	1,440	1,500
12	1,600	1,530	1,600
13	1,600	1,620	1,700
14	1,600	1,710	1,800
15	1,600	1,728	1,800
16	1,800*	1,746	1,800
17	1,800	2,646*	1,800
18	1,800	2,763	1,800
19	1,800	2,685	1,800
20	2,000	2,700	2,000
21	2,000	2,670	2,000
22	1,950	2,646	1,900
23	1,950	2,763	1,900
24	1,850	2,685	1,800
25	1,850	2,700	1,800
26	1,730	2,670	1,700
27	1,730	2,112	1,700
28	1,640	2,088	1,600
29	1,570	2,022	1,500
30	1,500	1,950	1,400

* Stimulant applied.

[1] Pahang Tenggara Study Paper No: 18 Table A3 column 3.[1]

[2] Johor Tenggara Working Paper "Rubber" Table 5.[6]

Table 8.11 Rubber Labour Requirements Steep Land (mandays per acre planted)

Year	0	1	2	3	4	5	6	7	8	9	10	11	12–15	16–25
Establishment														
Survey and land clearing	4.0	9.0												
Weed control after land clearing		0.3												
Cover crop establishment and maintenance		3.5												
Lining, holing, terracing, planting		26.7												
Road construction		0.3					2.5							
Drainage	0.1	0.4	0.6											
Village site clearing			0.3											
Sub-total	4.1	40.2	0.9				2.5							
				CONTRACT ←				→ ESTATE LABOUR						
Maintenance														
Weeding		7.4	16.1	12.7	9.3	5.8	3.9	4.1	4.1	3.9	3.9	3.9	3.9	3.9
Fertilizing		0.9	0.9	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Pruning		0.5	1.5	1.5	1.5	1.5	1.5	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Road maintenance		0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Drainage maintenance				0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Tapping, collecting and opening								16.0	31.0	34.4	36.5	37.2	39.2	41.4
Stimulating														3.6
Coagulating and storage								0.4	0.7	0.9	1.0	1.1	1.1	1.4
Transporting coagulum								0.3	0.4	0.5	0.5	0.5	0.6	0.7
Sub-total		9.1	18.8	15.8	12.4	8.9	7.0	24.4	39.8	43.3	45.5	46.3	48.4	54.8
TOTAL LABOUR INPUTS	4.1	49.3	19.7	15.8	12.4	8.9	9.5	24.4	39.8	43.3	45.5	46.3	48.4	54.8

Table 8.12 Labour Required per 1,000 Acres Estate Rubber

Year	0	1	2	3	4	5	6	7	8	9	10	11	12–15	16–25
Contract	55	164	66	47	35	24	26							
Direct				6	6	6	6	81	133	144	152	154	161	183
TOTAL	55	164	66	53	41	30	32	81	133	144	152	154	161	183

Labour requirements have been estimated by the Consultants[134] and these are shown (Table 8.11) in terms of mandays per planted acre on a yearly basis. Table 8.12 shows the yearly manpower requirements per 1,000 planted acres from clearing to maturity and during the productive life of the crop.

Manpower requirements for settlement schemes are not presented because there is unlikely to be a development of this type in Trengganu Tengah.

Rubber Processing

There are no modern rubber processing plants in Trengganu Tengah. It is most likely that any new plants will be for the production of SMR or liquid latex. The smallest economic size of factory for SMR is estimated to have a capacity of 10 tons/day. On the basis of an average yield of 1,500 lb/acre during the first six years of tapping and assuming a peak monthly yield of 10 percent of the yearly total, 1,000 planted acres requires 2.6 tons/day processing capacity. This will increase to 3.57 tons/day when the annual yield peaks at 2,000 lb/acre. Thus a 10 ton/day SMR plant requires a planted area of 3,846 acres. However, in planning rubber processing plants for Trengganu, the desirability of centralised processing facilities must be considered and it is likely that a single large SMR plant will be set up to deal with a wide area of rubber planted on several estates. The Processing of rubber is discussed in detail in Chapter 10.

8.4 Market and Price Prospects for Oil Palm and Rubber

8.4.1 Oil Palm Market Prospects

The present world production of palm oil is in the region of 2 million tons, of which 30 percent is produced in Malaysia, 25 percent in Nigeria and a further 28 percent in other West African countries, notably Zaire and the Ivory Coast. By 1980 the FAO estimates[69] that this will have risen to 4.3 million tons and may have risen as high as 5 million tons. Thus the 'medium' estimate shown in Table 8.13 indicates an annual average increase in output from 1970 to 1980 of between 9 and 10 percent for palm oil and of 5 percent for palm kernels. These growth rates are very high by comparison with recent FAO projections[67] for supplies of all fats and oils, which are

forecast to increase at an annual rate of about 3 percent. Thus palm oil is expected to nearly double its share of total world supplies of fats and oils by 1980, from 4 percent in 1970 to nearly 8 percent in 1980.

The main impetus for this growth will come from Malaysia, where the area under oil palm rose from 242,000 acres in 1965 to 800,000 acres in 1970 and is expected to rise to 1,383,000 acres by 1975.

In West Africa, where palm oil is the main domestically consumed oil, much of the increased production will be absorbed by the local market, and exportable supplies from Nigeria, Zaire and Sierra Leone are not expected to rise at all. In the Far East however, and especially in Malaysia, the outlook is quite different, and by far the major part of increased output is destined for the export trade. The FAO calculates[68] that world export supplies, net of domestic consumption by producers, will reach 2.8 million tons by 1980 and may be as high as 3.4 million tons. The lower of these two estimates represents an annual growth in exports of 14 percent from 1970 to 1980, compared with 2.9 percent in the 1960's and 3.8 percent for all oils and fats in that decade. The expected increase in exportable supplies each year will amount to some 200,000 tons.

In achieving a larger share of the total world market for fats and oils, it seems that palm oil producers will almost certainly have to accept relatively lower prices, for in certain respects palm oil is at competitive disadvantage with other fats and oils. Some of these disadvantages are itemised below.

(i) The high elasticity of supply of oil-bearing annual crops such as sunflower, soya beans and groundnuts.

(ii) The fact that, with several other major oil crops, the oil is to some degree only a by-product. For example, soya beans and sunflower are crushed to produce high protein livestock meal as much as to produce oil. Increases in demand for livestock products have resulted in a considerable growth in this market and have been a major influence on the increase in the output of soya beans in particular. Producers of soya beans in the United States rely primarily on the livestock market and are consequently able to absorb falls in oil prices more easily than producers of oil-specific crops. Another major source of vegetable oil is cotton seed, the production of which is determined by factors quite outside the oil market.

(iii) Actions by governments to protect producers from world market fluctuations, particularly in North America, Europe and U.S.S.R. These have taken the form of concessional sales of products in third markets (e.g. P.L. 480 sales of soya bean oil to India, Pakistan and countries in the Middle East and North Africa). Furthermore although the income elasticity of demand for fats and oils by developing countries is high, these markets are often restricted by exchange controls as well as by concessional sales.

Table 8.13 World Palm Oil and Palm Kernel Production in 1970 and 1971 and FAO Forecasts for 1980

	Palm oil					Palm kernel				
			1980 forecast					1980 forecast		
	1970	1971	Low	Medium	High	1970	1971	Low	Medium	High
	'000 tons									
Main Producers										
Malaysia	429	589	1800	2100	2500	92	124	360	420	500
Nigeria	508	500	570	650	770	298	310	400	450	530
Indonesia	215	225	350	450	550	47	50	70	90	110
Zaire	180	200	–	275	–	130	130	–	130	–
Ivory Coast	50	67	220	250	280	19	23	78	85	92
Dahomey	45	47	85	100	115	94	80	80	90	100
Cameroon	54	56	80	95	110	45	47	65	75	85
Colombia	26	34	–	50	–	–	–	–	12	–
Sierra Leone	53	60	–	60	–	59	55	–	70	–
TOTAL	1560	1778	3490	4030	4710	784	819	1265	1422	1629
Other Producers										
West Africa	129	130	–	171	–	98	105	–	100	–
Central Africa	24	25	–	30	–	22	23	–	26	–
Latin America	56	59	–	77	–	55	56	–	57	–
Others	1	1	–	12	–	1	1	–	5	–
TOTAL	210	215	290	290	290	176	185	188	188	188
WORLD TOTAL	1770	1993	3780	4320	5000	960	1004	1453	1610	1817

Source: FAO (1973) Document CCP: OF 72/2 (revised).[68]

(iv) The relatively low substitutability of palm oil for other oils. Although technical advances in recent years have increased the degree of substitutability between different oils, palm oil is still at a disadvantage in this respect by comparison with most other oils and fats. It is a relatively high 'saturated' oil (i.e. it contains a high proportion of saturated fatty acids) and as such it can be made to serve a much narrower range of end uses than for example, the 'soft' or 'fluid' edible oils such as soya bean, sunflower, groundnut or fish oils. At the same time it is relatively unspecific from a demand point of view, having no tied markets as do, for instance, the industrial oils (castor or linseed) or the lauric oils (coconut or palm kernel). Thus palm oil (but not palm kernel oil) can easily be replaced by other oils but can less easily be used to replace them. Palm kernel oil, on the other hand, has a relatively high degree of specifity as a cooking oil and for use in margarine.

Table 8.14 lists the range of long-term price forecasts for palm oil used in recent feasibility studies. It is important to note that none of the forecast prices bears much comparison with present export prices. In common with most commodities on world markets the price of palm oil has virtually doubled in the last two years and has frequently been over $ 1,000 per ton FOB. Nevertheless, even the most recent projections by IBRD, while allowing a sizeable increase over previous projections, still forecasts price levels well below those currently prevailing.

In times of severe international inflation and freely floating exchange rates it is often difficult to be clear on what a particular long-term price forecast is meant to indicate. Certainly, no one today would imagine, except in the event of a very severe world recession, that the money price of palm oil traded on world markets in 1985 will be as low as $ 650 per ton. On the other hand, a forecast that the price of palm oil would be 50 to 60 percent of its present level in relation to factor costs is quite acceptable in the light of the enormous projected increase in supplies and the very wide disparity between gross revenues and costs of production at current prices.

The most recent IBRD projections (August 1974) put a long-term 1985 price of around $ 650 per ton FOB on palm oil and of around $ 400 per ton on kernels. These are substantially above any previous projections and clearly accept the logic that an overall scarcity of food and other raw materials, accompanied by a continued rapid growth in world population and trade, will result in a long-term shift in the terms of trade in favour of agricultural commodities. They also make some allowance for the considerable increase in production costs which has occurred over the last two years.

In the present study, the Consultants have accepted this logic in part and have assumed long-term FOB prices of $ 600 for palm oil and $ 400 for kernels.

Table 8.14 Actual and Projected Export Prices of Palm Oil (5 percent FFA)

	1965–70 average	1974 (1st 6 months)	1980	1985	1995
Actual (average FOB Malaysian exports)	580	950	–	–	–
IBRD appraisal of Jengka Triangle (1967)	–	–	420	420	420
Bevan and Goering (1st Malaysian Oil Palm Conference 1967)	–	–	380 – 440	380 – 440	380 – 440
Oil palm feasibility study, Thailand (1968)[1]	–	–	370 – 450	345 – 425	320 – 400
Johor Tenggara Study (1971)[1]	–	–	380	360	344
Miri Bintulu Regional Planning Study, Sarawak (1974)[1]	–	–	432	398	398
IBRD (1974)	–	–	650[2]	700[2]	–

Notes: [1] Hunting Technical Services Ltd.

[2] Approximate FOB equivalents from projections expressed as CIF UK.

8.4.2 Rubber Market Prospects

Table 8.15 shows the projected global demand for rubber and Table 8.16 the projected production range in 1975 and 1980 by the International Rubber Study Group in 1971. At the time these projections were made it was assumed that the price for natural rubber would be set by the cost of producing synthetic rubber provided that natural rubber production did not exceed the demand for it on technical specifications. The main problem foreseen in this projection was that, with possible productivity increases in the natural rubber industry, the price of natural rubber might spontaneously fall below the ceiling set by synthetic prices. In these circumstances the major argument of the natural rubber producers was that the synthetic producers should limit their isoprene rubber capacity (the most direct competitor to natural rubber) so that the demand and supply for isoprene rubbers would be balanced by 1980.

Table 8.15 Projected Demand for Rubber 1970 to 1980

	1970	1975	1980	Percent share 1980
		'000 tons		
Natural rubber	3,000	3,720	4,820	35.4
Synthetic rubber (1)	4,460	6,410	8,780	64.6
TOTAL RUBBER DEMAND	7,460	10,130	13,600	100.0

(1) Excluding Communist Bloc.

Source: International Rubber Study Group, Summary Proceedings of 1972 Conference.

A later projection given in 1973 by the Rubber Research Institute of Malaysia and the Natural Rubber Producers Research Association showed total world demand for all rubbers reaching 17.5 million tons by 1980 of which approximately 6.3 million tons would be for natural rubber, assuming 5 million tons would be absorbed by the western industrialized nations and the remainder by the Communist bloc. The major conclusion of this projection was that the projected natural rubber price was much more favourable than had been previously assumed and that producers would have to make considerable efforts to meet the 1980 natural rubber demand of 6.3 million tons.

Since these projections were made, cost inflation has been rapid in the industrialised countries and with substantial increases in oil prices at the beginning of 1974 the whole problem of competition between synthetic and natural rubber has completely changed.

Synthetic rubber has become more expensive to produce because of increased feedstock costs. However, the relative scarcity of oil has also cast doubts on the possibility that the rate of industrial growth, implied in former 1980 demand projections for rubber, can now be maintained. Therefore although natural rubber is

likely to improve its competitive position against synthetic rubber, it may have to do so in the context of a decline in the rate of growth of total rubber demand.

Table 8.16 Projected natural rubber supply 1975 and 1980

	1975	1980
	metric tons	
Malaysia	1,900,000	2,500,000
Indonesia	920,000	1,055,000
Thailand	380,000	485,000
Sri Lanka	184,000	195,000
Vietnam	70,000	82,000
Singapore	250	50
India	140,000	200,000
Liberia	96,000	140,000
Nigeria	125,000	130,000
Brazil	25,400	–
Ivory Coast	18,000	20,000
TOTAL	3,858,650	4,807,050
TOTAL WITH STIMULATION	5,300,000 to 5,500,000	

Source: International Rubber Study Group, Summary proceedings of 1972 Conference.

Thus the future market for natural rubber is somewhat uncertain. Increasing costs of production for synthetic rubber should lead to more substitution by natural rubber. But as the short term supply of the latter is inelastic, increased demand for it would lead to higher prices, thus lessening in the short term the decline in the competitive position of synthetic rubber. On this assumption, until 1980 at least the ceiling price for natural rubber would still be set by the price at which synthetic rubber could compete. In the longer term, this situation could change since the long term supply of natural rubber is potentially highly elastic, and if the total demand for rubber failed to grow at the rates predicted in the past then competition amongst natural rubber producers could become more important in setting natural rubber price than competition from the synthetic industry.

On balance, it is estimated that the total demand for natural rubber should be over the 6 million tons by 1980. Thereafter, possible natural rubber demand could range from 7 to 8 million tons by 1985 when the price could begin to be more heavily influenced by excess natural rubber production rather than by the price of synthetic rubber. It should be emphasized, however, that all projections are highly speculative at the moment, since the full implications of crude oil price for world trade and industrial growth are as yet far from clear.

Until 1973, the price projected to 1985 for natural rubber by IBRD was 21 US cents per lb. CIF New York. This price was taken as the long term equivalent synthe price. Although further technological breakthroughs which would further reduce the pr of synthetic rubber were not ruled out, it was thought at the time that relatively more rapid inflation in the industrial nations would make further falls in the price of synthet unlikely. With the substantial increase in crude oil prices in 1973/74, the possibility of cheaper synthetic rubber supplies has been ruled out, and the projected natural rubber price has been revised to 35 US cents per lb. in 1980 and 33 US cents CIF New York in 1985. Allowing for ocean freight at 5 US cents per lb. this would give a projected FOB price ranging from 67 to 72 Malaysian cents per lb. In view of the fact that considerable replanting has taken place at an average projected price of 50 Malaysian cents per lb, this price level would stimulate even further replanting or new planting among the world rubber producers and the Consultants feel it is rather too high as a long term real price projection. The projected average FOB price for all grades has therefore been reduced to 60 Malaysian cents per lb, or 132 cents per kilogram.

8.5 Prospects for Diversification of Agriculture

8.5.1 Introduction

On a national level great emphasis is now being placed on promoting agricultural development in fields other than rubber, oil palm and padi which presently dominate the rural (and export) economy of Malaysia. There are valid reasons for this policy, including the need to produce more food for home consumption and to reduce the risk to the economy of relying on only one or two major primary products for foreign exchange. However, implementation of a successful diversification programme depends on the availability of areas suitable for growing the crops selected and on the degree of knowledge presently available on the agronomy of these crops under local conditions. It must be admitted that Trengganu Tengah is a part of the country with basically adverse conditions to agriculture of any kind and that local agronomic knowledge is largely confined to the major crops of the country namely, rubber, oil palm and padi. Because of this, the Consultants, after examining a number of possibilities [133] have selected a limited range of crops which might be planted on a commercial scale after an intensified programme of field trials and pilot projects, which is discussed below in sub-sections 8.6.6 and 8.6.7.

The Consultants believe that the implementation of a policy of diversified agriculture has to be in two stages. The first is research and investigation (which will take at least five years for most crops) and the second is commercial implementation. Thus diversified agriculture in Trengganu Tengah is unlikely to start on a commercial scale until after 1980, and production is unlikely to start until the second half of the decade 1980 – 1990.

This conflicts with the present desire to open up large areas of land each year during the present decade because most investors can, rightly, only be sure of an economic return from the proven crops i.e. rubber and oil palm. However, because of the constraints imposed by logging and the present inaccessibility of many areas of

development land, there will have to be a slackening of the present pace of development which should enable knowledge of new crops to be built up in time for the implementation of sound commercial projects on this land before it is all committed to oil palm and rubber.

At present, the area of land already occupied or committed to development totals 235,591 acres of which only about 5 percent is in crops other than rubber and oil palm. In fact some 77 percent is under oil palm (Section 8.2). Given the natural constraints of Trengganu Tengah it would seem to be a reasonable target for a minimum of 10 percent of the total area with development potential to be designated to crops other than rubber and oil palm. The crops which have been selected for consideration are discussed in the following paragraphs.

8.5.2 Cocoa

Cocoa is grown on two private estates in the north of Trengganu Tengah. Planting was started on the Jerangau Estate in 1950 and on Landas Estate in 1956, and both of them are under one management. Commercially, this venture has not been very successful mainly on account of the serious disease problems encountered during the early years. However, Jerangau estate is now showing some profitability, indicating that this crop is still a prospect for further development. In addition, much useful experience on all aspects of growing cocoa in Trengganu has been built up over the last twenty years and the management of the estates has put considerable emphasis on the research aspect of its activities.

In the light of this experience and knowledge it seemed reasonable to consider cocoa as a commercial diversification crop in the early part of the development programme. However, disease problems have still not been overcome, and Die-Back Disease, which is caused by a fungus, *Oncobasidium theobromae*, is a major constraint to further expansion of cocoa in Trengganu. The disease can prove fatal to seedling cocoa, and on mature trees it results in the progressive dying back of the young branches with loss of leaf area and considerable reduction in yields. The original planting material (Amelonado variety) which was introduced to the Jerangau and Landas estates, has proved to be particularly susceptible to the disease. Upper Amazon and Sabah hybrid material were subsequently introduced and have shown varying degrees of resistance to Die-Back Disease. A programme has been started on the estates for the selection of promising clones from which it is hoped to produce planting material with a reasonable degree of resistance. This may be achieved within the next five years. If this programme is successful the material produced could be used to plant one or more small estates (1000 – 2000 acres) with cocoa on the Class 1G, 1g, 2G and 2g soils (Development Capability Class A) in Trengganu Tengah. Soils with a high clay content are preferred to reduce the possibility of moisture stress during dry periods but drainage must be good. Since the soils of Trengganu Tengah are strongly acid it is considered that substantial liming of them may be necessary.

It is envisaged that any planting undertaken would have to be limited to small estates so as to minimise the disease risk and because cocoa requires more intensive management than rubber or oil palms. Initially, it is not considered to be suitable for a smallholder scheme on account of the technical problems likely to be encountered.

Conservative estimates of yields under Trengganu conditions forecast a peak annual crop of 1,000 lb/acre in the ninth year after planting. Peak yields of up to 1,400 lb/acre have been recorded from some of the Upper Amazon material in Jerangau Estate. Amelonado material badly infected with Die-Back Disease is yielding as low as 400 lb/acre and is not considered worth cultivating at this level. Cocoa estates in other parts of Peninsular Malaysia are yielding up to 1,600 lb/acre, and in Sabah yields of up to 2,000 lb/acre are obtained on volcanic soils. In Trengganu, there is a very marked peaking of yield during November and December when 40 percent of the annual crop may be harvested.

In other parts of Malaysia, cocoa is being grown under mature coconuts which provide adequate shade and further increase the returns from the land. Yields of 1,200 lb/acre cocoa and 10 piculs/acre copra have been obtained on West Coast estates. However, in Trengganu Tengah there are no areas planted with coconuts which could be underplanted with cocoa. Such a project will therefore depend on the development prospects for coconuts and would involve a waiting period of eight years before the coconuts were tall enough to permit underplanting with cocoa. It would then take a further three to four years before the cocoa came into bearing giving approximately a twelve years development period in total.

Cocoa can be grown together with fruit trees which provide shade and a secondary income, but most types of fruit trees are not tall enough to provide sufficient shade. Bananas can be underplanted with young cocoa and quick growing shade trees substituted as the cocoa becomes older.

The labour requirement for cocoa is about 15 acres per man once the crop reaches maturity. However, due to the seasonal nature of yield (40 percent in November – December, practically none in May and June) some of the labour force would be employed on a casual basis for harvesting. Proposed cocoa estates should thus be sited near settlement areas which would also provide a market for the fruit crops grown in conjunction with the cocoa.

In the event that cocoa can eventually be grown successfully in Trengganu Tengah, the availability of a suitable market outlet should be no problem. It is envisaged that the major outlet for cocoa beans in Malaysia will be the domestic market. With rising income the prospects for the crop are seen as relatively favourable and a considerable increase in the present and planned planted area of approximately 30,000 acres will be required to meet future internal demand.

Price projections are difficult to make, since new cocoa production is unlikely to occur in Trengganu Tengah before the mid-1980's and conditions on world markets determining prices are obviously unpredictable that far ahead. In the past cocoa has normally been in surplus on world markets and the pressure on prices in real terms has normally been downwards. However, cocoa is subject to large scale speculative dealing and prices can be very volatile in the short term. In keeping with all other agricultural commodities a startling rise in the price of cocoa has been seen in the last two years. It rose from £263 per ton cif London in 1972 to £507 in 1973 and to a peak of £1,250 in early 1974. At the beginning of August 1974 the price was £1,033 per ton but it fell rapidly through the month to close at £819. In constant

dollar terms IBRD are projecting a decline in the cocoa bean prices from US $1,612 per ton in 1974 to US$1,165 per ton by 1985. These prices would equivalent to $ M 2,796 per ton FOB.

In estimating the value of cocoa production in Trengganu Tengah a price of $2,500 per ton has been used.

8.5.3 Coconuts

Coconuts are found in many different locations throughout Malaysia and considerable areas on the West Coast are planted in estates. In Trengganu, estate type production is very limited and generally speaking unsuccessful. This can be attributed to the very poor soils (the Bris coastal soils) on which the estates are situated. There is no record of fertilising the crop to correct the nutrient deficiencies and on Kretay Estate the coconut area has been abandoned. The growing of coconuts in Trengganu Tengah has so far been confined to small groves in the kampungs. There is no reason to suppose that coconuts could not be grown successfully on soils which are presently considered suitable for oil palms.

Potential yields depend to a great extent on the type of planting material selected. The varieties currently planted in Malaysia are classified as tall and dwarf. The tall varieties are more tolerent of varying soil conditions than the dwarf palms, but the latter is the higher yielding group. Dwarf palms are not so suitable if inter-cropping or grazing is contemplated in the early years and it is thought that the tall type may be better suited to conditions in Trengganu Tengah. With planting densities of 60 – 70 trees/acre peak yields of copra in excess of 11 piculs (1500 lbs)/acre could be expected with good husbandry. In West Africa, hybrid palms have given yields equivalent to more than 25 piculs (3,300 lb)/acre. If this potential can be realised under Malaysian conditions the attractions of coconuts as a crop would be greatly enhanced. However, the West African hybrids are new to Malaysia and they have not been tried in areas similar to Trengganu Tengah.

On the basis of present yields and prices, oil palms give a much higher return per acre in a pure stand than coconuts under Malaysian conditions. However, if the West African hybrid material realised its expected potential in Malaysia coconuts and oil palms would give about the same returns at current relative prices for palm and coconut oils. Furthermore, additional income can be generated by intercropping under coconuts. During the immature period annual cash crops can be grown as well as short-term fruit crops such as bananas, papaya and pineapples. Once the palms are mature cocoa or cattle can be raised under coconuts. As yet, oil palm offers no such opportunities for diversification.

Under present conditions it is unlikely that either private investors or the major development agencies would consider coconut planting as an alternative to large scale oil palm or rubber planting. Possibly, if the price for coconut oil remains substantially above other oils and it is proved that higher yielding varieties or cropping in mixed stands is technically feasible planting might be introduced on a small scale. This would also be dependent on the provision of satisfactory copra marketing and/or oil milling services in the area.

Pure stands of coconuts do not require a high input of labour. Once established, maintenance and harvesting of the crop requires only one man for 20 planted acres. However, extraction of the copra requires additional manpower. The crop is suitable for planting in areas where manpower is a constraint, and in these circumstances a mixed enterprise with cattle could be considered. More labour is involved if other crops such as cocoa, fruits and vegetables are planted under the coconuts.

The prospects for increasing demand for coconut oil world-wide as part of the general trend towards increasing substitution of vegetable oils for animal fats and as a potential industrial oil are quite favourable, and successful development of new coconut plantations need not be inhibited by the market. However, similar reservations apply in predicting the long-term price as applied with palm oil. There seems little prospect of prices remaining at their present levels, in real terms at least, in the long term.

Table 8.17 shows CIF London prices for copra and coconut oil and the average wholesale price for coconut oil in Malaysia between 1970 and the first two months of 1974. These show a clear declining trend until 1972 under conditions of virtually static demand. Prices began to rise rapidly in the middle of 1973 and in the first quarter of 1974 had reached £650 per ton CIF London for coconut oil and US $970 per ton for copra. Apart from the special factors which have affected all commodity markets in the last two years, the major reasons for the rise were an increasing use of coconut oil as a fat substitute in artificial milk foods and a sudden dramatic rise in butter fat prices at the end of 1973 which occasioned a switch to coconut oil as a filler for concentrated tinned milk. Coconut oil has also considerable potential as an industrial oil but has not been used as such in the past because of ready availability of cheap mineral oil.

According to the latest IBRD projection, prices will decline from their peak 1974 constant dollar price of US $820 per ton of coconut oil and US $536 per ton of copra to $600 and $396 per ton respectively by 1985, which gives an equivalent Malaysian FOB price of $M 1,224 per ton for oil and $M 808 per ton for copra.

Table 8.17 London CIF prices for coconut oil and copra and Malaysian wholesale prices for coconut oil

	1970	1971	1972	1973	1974 (Jan& Feb
Copra US $ ton	227	190	143	349	759
Coconut oil £ ton	161	148	105	132[1]	n.a.
Coconut oil (Malaysian wholesale M$ per picul)	55.96	52.46	36.04	70.34	130

(1) January to October only.

Sources: FAO Monthly Bulletins of Agricultural Statistics
Monthly Statistical Bulletin of West Malaysia, May 1974.[14]

8.5.4 Fruit Crops

Most of the tropical fruits grown in Malaysia are perennial and many of them are already being grown in Trengganu in and around the existing settlements. Table 8.18 lists the main fruits grown and gives their Malay and English names.

Table 8.18 Fruits in Trengganu

Botanical Name[1]	Malay Name[2]	English Name
Achras zapota	Ciku	Sapodilla
Anacardium occidentale	Gajus, Jambu Golok	Cashew
Ananas comosus	Nanas	Pineapple
Annona muricata	Durian Belanda	Soursop
Artocarpus heterophyllus	Nangka	Jackfruit
Artocarpus integer	Cempedak	—
Carica papaya	Betek	Papaya
Citrus aurantifolia	Limau Asam, Limau Nipis	Lime
Citrus grandis	Limau Betawi, Limau Bali	Pomelo
Citrus hystrix	Limau Purut	—
Citrus suhuiensis	Limau Manis, Limau Langkat	Orange
Durio zibethinus	Durian	—
Garcinia mangostana	Manggis	Mangosteen
Lansium domesticum	Duku, Langsat	—
Mangifera foetida	Bacang, Macang	Horse Mango
Mangifera indica	Mangga	Indian Mango
Mangifera odorata	Kuini	—
Musa paradisiaca	Pisang	Banana
Nephelium lappaceum	Rambutan	—
Psidium guajava	Jambu Batu, Jambu Berasa	Guava

(1) Botanical names are those given in: ALLEN B.M. "Malayan Fruits" 1967.[54]

(2) Where two Malay names are given, the second is that commonly used in Trengganu.

Fruit production in Trengganu is confined to supplying the local market. With minor exceptions there is no movement of fruit outside the State and in fact much of the fruit consumed in the State is imported from other states and from Thailand.

Constraints to satisfactory fruit production in Trengganu Tengah are the soils, which are rather too acid for some fruit crops, and the heavy monsoon rains which tend to prevent good fruit setting and could increase fruit loss through disease. However, in spite of this, fruit crops do offer better possibilities for diversified cropping than most other alternatives.

The fruit crops which will produce relatively quickly after planting are bananas, pineapples, papaya, guava and soursop. The first three would be suitable intercrops for producing some income during the early years of a perennial tree crop programme

such as coconuts, rubber and cocoa. They are also relatively non-seasonal. Apart from soursop, they are suitable for canning purposes either alone or in combination withother fruits to make "fruit cocktails".

Citrus fruits are slower in growth but produce on a relatively non-seasonal basis. The heavy rainfall and acid soil conditions in Trengganu Tengah are far from ideal for citrus which prefers a more neutral soil and will not tolerate water-logging. Local varieties of Lime and Pomelo are grown successfully but much work remains to be done before citrus species, such as sweet orange and grapefruit can be considered commercially suitable.

The remaining fruits are slower to come into production and are seasonal in nature. These include Ciku, Jackfruit, Cempedak, Durian, Mangosteen, Duku Langsat, Mangoes and Rambutan. Apart from the Indian Mango, which requires a definite dry season to obtain optimum fruit set, these fruits could be grown satisfactorily in Trengganu Tengah. In the case of rambutan, attention must be paid to the selection of suitable clones for the area. The variety of *Lansium domesticum* grown in Trengganu is known as Duku Langsat and is highly regarded. Such a speciality could be developed as a fruit for export to neighbouring states, but it is seasonal.

The fruits listed above are to be found in most of the house plots of FELDA settlement schemes and in the kampungs already in the area. In many cases the planting material used was unselected and the fruits are not of a high quality. It is recommended that in future attention be paid to advising the settlers or smallholders of best varieties to plant and to supplying them with suitable material. The Department of Agriculture has two fruit tree propagation nurseries in or near Trengganu Tengah (at Ajil and near Kampung Ayer Puteh) and full use should be made of these.

Fruit crops will flourish best on the best available soils but Citrus, Ciku and Mangosteen can be grown on the second class soils of the area (designated Class B). Most fruit crops will not tolerate water-logging and thus low-lying land is unsuitable.

Apart from the pineapple estates in Johor, there is no large-scale fruit production in Malaysia at present. The present state of knowledge, the physical limitations of the area and the uncertain market possibilities preclude the immediate recommendation of any large scale fruit project for Trengganu Tengah. However, it is recognised that there will be an increasing demand for fresh fruit as the population of Trengganu Tengah increases, and provision should be made for this.

To provide for this demand, it is recommended that some land should be allocated near each major settlement for the establishment of fruit orchards. Initially, this could be done by the developers of large estate type projects who would, as a precondition of their being allocated land in Trengganu Tengah, be required to clear and establish an orchard on a suitable part of their land. Such an area need not exceed one percent of the total planted acreage (i.e. 50 acres per 5,000 acres.) The planning, selection of crops, maintenance and production should be controlled by LKTT and MARDI. The latter could regard these orchards as observation plots for variety and fertiliser trials of fruits but the actual production would belong to the estate developer and would logically find its way to the local fresh fruit market.

MARDI should commence a research programme into the agronomy of fruit growing in Trengganu Tengah to produce the information necessary to support a large scale fruit growing project which could be directed towards export markets for fresh or canned fruits. It is understood that FIMA are embarking on a large scale fruit project in Johor which includes canning. They also have a similar project under study in Pahang. These schemes should provide relevant information for similar projects in Trengganu Tengah.

There is no canning industry in Trengganu at present, but a small fish canning plant is being started by the Trengganu SEDC at their Kuala Ibai Industrial Estate, which could also be used for fruit canning. At the moment SEDC has plans, along with the Farmers Association of Trengganu and the Department of Agriculture, to set up a nucleus estate on which to base expansion of fruit growing largely for canning.

The labour requirements of fruits varies according to the type grown and in some cases according to the season. Fruit crops such as Durian, Ciku, Jackfruit, Cempedak, Mangosteen, Duku/Langsat and Rambutan have a peak requirement for labour during the harvesting period which in each case lasts from one to three months in one year. Maintenance of the crop is not likely to be more intensive than that of cocoa. For shorter term fruits such as pineapple, bananas and papayas one man can handle about 6 – 10 acres. For the tree crops mentioned above, manpower requirement would be about one man to 15 acres for maintenance and some harvesting. Additional labour would be required to meet peak harvesting demand.

Processing fruits for canning is fairly labour intensive and any proposed canning operation should be located in a settlement area where there is the possibility of employing female workers.

8.5.5 Sago Palm

This crop has been grown in Malaysia for centuries and can be seen in small groves in swampy areas in Trengganu. Little research has been done on the crop in Malaysia and planting material is generally collected from the semi-wild groves. The harvesting of crop takes place some 8–10 years after planting and for investment purposes the delay in return is unattractively long. However, once planted, the maintenance costs are low and the crop can be grown on areas of waterlogged swamp land which, without costly drainage, are suitable for little else. This type of land, designated as Class D in the Consultants' Development Capability Classification, accounts for more than 30,000 acres in the development area. So far only one, 400 acre, commercial sago project has been proposed and approved but there would seem to be more scope for this crop.

Yields depend on planting density and time of cutting the tree and not much is known about the potential on an estate basis. A conservative projection made for the Pahang Tenggara Study[1] estimates annual yield at about 10 tons/acre of starch at 12 percent moisture content which is reached at the 10th year after planting.

Labour requirement during the immature years (i.e. up to Year 8) is very low at about one man to 50 acres. When harvesting starts, additional labour has to be recruited and in the 10th Year one man for five acres is required (according to the Pahang Tenggara Study). The high labour requirement for harvesting may well prove to be a limiting factor to extensive planting of sago palm in Trengganu Tengah.. Labour required for processing is minimal.

8.5.6 Annual Crops

A range of annual crops was reviewed by the Consultants including rice, maize, groundnuts, soyabeans, tobacco and vegetables. It was concluded that extensive cultivation of these crops is precluded by soil and climatic conditions. In fact any cropping pattern which requires regular overall mechanical tillage of the soil is not recommended in Trengganu Tengah because of the risk of erosion. Therefore, it is likely that production of these crops will remain in the hands of smallholders working on a seasonal basis on existing alienated padi lands and river terraces.

As the population of Trengganu Tengah increases, there should be a corresponding increase in demand for food crops, especially vegetables. This demand should stimulate increased production on the existing smallholdings and possibly FELDA schemes (although the FELDA dusun areas have never been utilised for this purpose by the settlers). There will also be a demand for vegetables in the towns immediately outside the development area especially in the south where Kuantan and the Tanjong Gelang port will in future become a major conurbation. The Consultants believe that Trengganu Tengah is well placed to serve the needs of this potential market with vegetables.

8.5.7 Livestock

The main categories of livestock reared in Malaysia are cattle, buffaloes, goats, sheep, pigs and poultry. In Trengganu the most important of these are cattle, buffaloes and sheep (Table 8.19).

Table 8.19 Livestock Population of Trengganu State, 1971

Category	Number	% of National Population
Cattle	39,414	12
Buffaloes	20,103	9
Goats	6,287	2
Sheep	3,585	10
Pigs	2,012	<1

Source: Statistical Digest 1971, Ministry of Agriculture and Fisheries Kuala Lumpur, 1973.

At the national level only pigs and poultry are at present being reared in intensive production units but there are no such units in Trengganu. All types of livestock in the State are typically kept near the kampung areas and used for draft or food production to satisfy local demands. In the case of cattle, however, Trengganu is a net exporter to other states but production consists of grazing on way-side verges and in padi fields during the non-cropping season. The large population of buffaloes is concentrated in the principal rice growing areas in the Districts of Besut and Kuala Trengganu.

In the context of Trengganu Tengah, local demand for meat is likely to rise with population increase during the development period. It does not seem likely that the local demand for pig meat will increase greatly because the majority of the population in the area are Muslims and large scale immigration of non-Muslims it not foreseen. Demand for poultry products, (eggs and meat) will certainly increase and it is foreseen that more intensive units will be set up to cater for local demands. Because of poor communications, Trengganu Tengah is at present at a disadvantage compared with other regions for the supply of external markets. This situation may change with improved communications and the ability to supply external markets will be determined by the costs of production under Trengganu Tengah conditions.

In recent years attention has been focused on the possibility of large scale cattle rearing for beef and dairy production and several schemes are now in the development stage with both public and private sector participation. These projects are all devoted to the production of beef, with the exception of the Johor scheme which is primarily for milk production serving the large potential markets of Johor Baharu and Singapore. There are at present no such markets near Trengganu and for this reason production of milk in the State could only be considered on a very limited scale for local consumption.

The beef projects are following the policy of crossing local cattle, Kedah-Kelantan and Local Indian Dairy (L.I.D.) with imported breeds from Australia, U.S.A. or Europe. Most authorities agree that this is the quickest way to exploit the hardiness of the native breeds while improving their productive capability. There is a school of thought, however, which favours improvement within the native breed which, although it is smaller than crossbred cattle, can produce the same live weight gain as the crossbreds off a given area while maintaining its full hardiness. This is a minority opinion and some sources forecast that such a programme of improvement would take forty years to complete.

Much work remains to be done on selection of the best system of breeding to produce heat resistant, disease resistant stock which are also economically productive. There is also the need to select the most suitable species of grasses and legumes for pastures in wet tropical conditions and the formulation of pasture management or zero-grazing (cut and carry) systems to best utilize the pastures. While breeding and selection of suitable stock for the country can be carried out in any suitable area, the problems of pasture management have to be investigated under local conditions.

There is already one cattle project near Trengganu Tengah which should supply much useful information on both aspects of beef production. This is the cattle scheme started by the National Livestock Development Authority (MAJUTERNAK) in 1973 at Kuala Brang and scheduled for completion by 1980. The total project area is 5,000 acres and the aim is to build up a breeding herd to supply dairy and beef animals for other schemes. Approximately 600 acres have been planted with various grasses and legumes including: Guinea Grass *(Panicum maximum)*, Kazangulu Grass *(Setaria spp)*, Hamil, a variety of Guinea Grass, Para Grass *(Brachiaria mutica)*, Pangola Grass *(Digitaria decumbens)*, Star Grass *(Cyndon plectostachys)*, Napier Grass *(Pennisetum purpureum)* and Stylo *(Stylosanthes guyanensis)*, a legume.

The site of this project is on fairly flat land with a number of small steep hills with slopes of up to 50°. During the monsoon season much of the area is temporarily flooded, and the cattle will have to be sheltered on the high ground at such times. It is anticipated that very careful grazing management will be necessary to prevent destruction of the pastures and erosion of the slopes during the monsoon season and some kind of fodder conservation may be necessary to provide food for the cattle during this period. Planners in other areas have indicated that land for cattle schemes should not have slopes exceeding 6° because of the necessity to cultivate the land periodically and to reduce the risk of erosion. There are no large areas of such land in Trengganu Tengah.

The Kuala Brang project and those in Pahang and Johor should provide much useful information on the performance of the various crossbreeds produced and the type of pasture and system of management most suitable for Malaysian conditions. These schemes will also start to build up of a nucleus of Malaysian personnel with expertise in cattle rearing in the wet tropics. Lack of such people is a constraint to development at present.

A commercial cattle project is not recommended for Trengganu Tengah at present. There are too many unknown factors, but it is thought that many of these will be resolved during the next five years. However, in anticipation of a development in later years, research work could be started on pasture grasses to determine their productivity under Trengganu conditions and this would best be done by MARDI. Close observation of the cattle breeding at Kuala Brang should provide sufficient indication of the problems likely to be encountered in Trengganu Tengah and the scheme might be able to supply a nucleus of breeding animals and the necessary expertise and supervision for further schemes in the area. The possibility of rearing cattle in conjunction with a tree crop such as coconuts has already been mentioned and if a coconut area can be successfully established part of this could be set aside for pasture studies and a potential cattle project.

The State Veterinary Department is doing valuable work in improving the productivity of smallholders' livestock by providing stud services and operating the "pawah system." The latter consists of giving the farmer an animal which he looks after and pays for by returning to the Department the first calf. Where suitable grazing conditions are available, this service could be extended in Trengganu Tengah to meet some of the increased demand for meat in the future.

Cattle production has a low manpower requirement and is thus suitable for areas where lack of manpower is a constraint to other types of development. However, supervision and management must be of high quality to ensure success.

8.5.8 Inland Fisheries

The Consultants have already prepared a formal assessment[132] of the potential for inland fishery development in Trengganu Tengah and this section summarises the findings. Two kinds of factor limit the development of inland fishing in the area; the first is the physical limitations imposed by terrain, high rainfall and flooding, and the second is the economic limitations imposed by the competition to fresh water fish from the abundant supplies of cheap marine fish available near Trengganu Tengah.

The physical limitations cannot be altered very much. It is unlikely that large areas of inland fishponds are feasible, even if they were economic, because of the likelihood of flooding in the monsoon season. The present inland fishing grounds are the rivers, padi fields, swamps, disused mining pools and the few fish ponds in the area. The recreational value of river fishing should be conserved by ensuring that development of the area does not result in pollution of the rivers. Some small increase in yield of padi field fish could be obtained by the construction of sump pits, but the padi growing areas in Trengganu Tengah are not extensive. The swamps and mining pools do not at present offer suitable environmental conditions for fish farming on a commercial scale. The State Fisheries Department is already offering extension services and free supplies of fry to fish pond owners. This activity will stimulate some increase in production but on a limited scale.

The people of Trengganu are by tradition large consumers of marine fish either fresh or preserved, and they have always had access to abundant supplies at reasonable prices. The modernisation of the East Coast fishing industry will increase these supplies and prices should remain stable. A change in the consumption pattern does not seem likely.

In spite of these factors two possibilities for development of inland fisheries have been identified. The first is the construction of fish ponds to produce luxury, high priced aquatic species such as fresh-water prawns, turtles (labi-labi), frogs and aruan. These would not compete on the low priced markets, but would be aimed at consumers prepared to pay a luxury price. This kind of project requires a very high level of management and should be preceded by a feasibility study (see Appendix F) and a pilot project. The second possibility is a limited increase in the production of lower priced species on a cooperative basis to serve the immediate needs of specific projects, such as FELDA schemes and estates,particularly in those areas remote from the coast which may not have regular supplies of marine fish. Small fish pond projects with these aims have already been started by FELDA and estate companies.

8.5.9 Crops Considered to Have Little Potential for Development in Trengganu Tengah

In the Discussion Paper[133] on the opportunities for diversifying the agriculture of Trengganu Tengah, the Consultants considered a wide range of crops grown in Malaysia and other tropical countries. The Paper explains in detail the reasons for choosing the crops selected for the agricultural development programme and it is proposed here to list (Table 8.20) the principal reasons why some crops were considered unsuitable. In some cases these crops may be grown on a limited scale to supply local markets and this is indicated in the table. The limiting factors considered are, in some cases, absolute (such as climate, soils etc.) and in others they are limiting under present conditions and should therefore be taken as reasons for deferment. In these latter cases conditions are changeable and future commercial production might be possible if, for instance, pest and disease problems are overcome or market conditions changed. For the purposes of this study, however, the Consultants have selected only those crops which at present, seem most likely to have potential for development on a commercial scale within the next five to eight years and which could therefore make a significant contribution to diversification within the present development period.

Table 8.20 Trengganu Tengah: Summary of Main Reasons for Rejection or Deferment of Certain Crops for Large Scale Development

Crop	Absolute Constraints	Reasons for Deferment								Some production for local use anticipated
	Climatic factors	Soil suitability limitations	Terrain limitations	Pest or disease limitations	Lack of Research or Production knowledge under local conditions	Lack of suitable planting material	Labour constraint	Limited markets	Low level of profitability expected	
a. Perennial										
Cashew	X									
Mango	X									
Coffee							X		X	Yes
Tea					X		X	X		
Pepper					X		X			Possibly
Sugar Cane	X		X						X	
Brazil Nut					X	X				Possibly
Avocado					X			X		
Passion Fruit	X			X						
Cloves	X									
Nutmeg	X									
b. Annual										
Padi		X							X	Yes
Maize		X	X							Yes
Tobacco		X	X				X		X	
Groundnuts		X	X							Yes
Castor		X	X	X	X			X	X	
Soya beans		X	X		X					Possibly
Tapioca		X	X							Possibly

8.6 The Agricultural Plan 1971 – 1980

8.6.1 Introduction

Agricultural development in Trengganu Tengah will take place in two phases. The first phase, essentially from 1971 to 1980 (the first decade of development) consists of the completion of projects started early in the decade and in the later 1960's and the implementation of those projects committed before the present study. The pace of the first phase of development was to some extent determined prior to the present study and it has been modified by the Consultants to minimize critical situations with regard to logging operations and availability of manpower, especially qualified personnel. These factors may become less critical in the early 1980's, and for this reason, the Consultants recommend that most of their proposals for new agricultural development should be implemented during the second decade of development. The second phase, from 1980 onwards, will therefore consist of the implementation of projects which will include diversified agricultural projects drawing on the information obtained from the applied research programme, pilot projects and feasibility studies carried out during the latter years of the present decade.

In the present section the development programme for the first decade, 1971 to 1980 is outlined in detail. The second decade, 1981 to 1990 is dealt with in Section 8.8.

8.6.2 Siting of Committed Projects

During the study period, the Board of LKTT approved eleven project proposals and requested that these should be incorporated in the development programme. These projects are listed in Section 6.1.5. Briefly, they consist of six oil palm estates (two in the public sector and four in the private sector), two pilot projects for castor, one sago project, one annual crop project and one agricultural research station for MARDI. The annual crop project is already sited and so are the castor oil pilot projects on tracts selected by the LKTT. The Consultants are requested to select the suitable areas for the remaining projects and for the Grass Protein Project.

(i) The Oil Palm Projects

The area of available land suitable for oil palm (Class A) is not sufficient to accommodate all the projects if they are given the acreage originally requested. The LKTT has instructed the Consultants that all the parties concerned should be accommodated and this has been done by reducing each allocated area.

A standard size of estate has been taken with a gross area of 6,700 acres which gives a net planted area of 5,000 acres, allowing a 25 percent reduction for unsuitable land, roads and buildings. It is proposed that each estate should be developed in three phases with a first phase of 1,350 gross acres (giving 1,000 planted acres) and second and third phases of 2,675 acres each (giving 2,000 planted acres per phase). The Consultants have selected areas of land in Class A which are in fact large enough in total to accommodate seven such estates. These areas will be directly served by the new road system already proposed for Trengganu Tengah.

There is no disadvantage in this size of estate if processing of the crop is undertaken in centralised mills, a concept which is discussed in Chapter 10. The proposed oil palm estates are referred to hereafter as OPE – 1, OPE – 2 etc. and allocation of a particular area to each applicant is left to the discretion of the Development Authority. The development areas selected and the phasing of development for the seven OPE's is shown in Table 8.21. The projects are phased to take into account the land availability after logging.

It will be seen that although the seven estates require a total gross area of 46,900 acres, the development areas selected (13, 16, 17, 19, 23, 24 and 25) have a gross area of 57,196 acres). This is accounted for by the fact that the classification of the development potential of the land in Trengganu Tengah is based on very general information regarding soil type and topography and it is thought that a semi-detailed survey of the selected areas will reveal more land which is unsuitable for planting with oil palm. It is strongly recommended that the team currently conducting a semi-detailed soil survey of Trengganu Tengah should be directed to these areas as a matter of priority and from their work more exact estimates of the potential planted acreage can be derived. In the case of development areas 16, 17, and 19, and 23, 24 and 25, exact boundaries should not be drawn until a suitable plantable acreage for each project has been identified. After the survey it may well be found that the planted area of each estate can be increased to more than 5,000 acres.

(ii) Other committed projects

At the request of the Development Authority, a grass protein project has been sited on an area of 2G soil identified as Development Area Number 5, which has a gross area of 5,248 acres. This area was selected by reference to the Soil Suitability Map.

The sago palm project has been sited on Class D land which is swamp considered suitable for this crop. The area has been given the number 34 and is located near Kampung Ibok (Kemaman District) on a swamp through which passes the Sungei Bungkus.

A site for a second MARDI Field Experiment Station in Trengganu Tengah (there is already one at Jerangau) has been selected. It is Development Area Number 26 which has a gross area of 1,645 acres. It has been selected for this use because it includes the major soil types found in the area namely those in Classes 2G, 2d and 3G.

Table 8.21 summarises these allocations and indicates the proposed phasing of development which has been designed to allow a reasonable period of time for extraction of the commercial timber.

Table 8.21 Committed Projects sited on new development areas

Project	Development Area		Crop	1974	1975	1976	1977	1978	1979	Acreage		Type
	Number	Acreage[1]								Gross	Planted	
OPE – 1	13	7,800	Oil palm				1,350	2,675	2,675	6,700	5,000	Estate
OPE – 2	16	10,406	Oil palm		1,350	2,675	2,675			6,700	5,000	Estate
OPE – 3	17	10,419	Oil palm			1,350	2,675	2,675		6,700	5,000	Estate
OPE – 4	19	6,445	Oil palm		1,350	2,675	2,675			6,700	5,000	Estate
OPE – 5	23	7,386	Oil palm			1,350	2,675	2,675		6,700	5,000	Estate
OPE – 6	24	7,962	Oil palm				1,350	2,675	2,675	6,700	5,000	Estate
OPE – 7	25	6,778	Oil palm		1,350	2,675	2,675			6,700	5,000	Estate
Private Estate	5	5,248	Grass/ Protein		450	1,100	850	150	2,698	5,248	3,000	Estate
Private Estate	34		Sago	100	100	100	100			400	400	Estate
MARDI FES	26	1,645	Research			500	500	645		1,645	1,234	Research
				100	4,600	12,425	17,525	11,495	8,048	54,193	39,634	

[1] Planimeter measurement.

8.6.3 The Balance of Land for Agricultural Development

Having sited the committed projects, all of which (except the sago project) have been given areas of Class A potential, and taking into account the existing and committed projects described in Chapter 6, the total area under ongoing and proposed developments is 235,591 acres (Table 8.22). In addition, a further 60,000 acres are taken up by small-scale alienations.

In Table 8.23 the projects identified to date are classified according to type and crop. The table indicates that the agricultural development so far is slightly weighted in favour of public sector projects, of which 50 percent are settlement schemes and most of the remainder are estates. The private sector projects are all estates but the SEDC/NADEFINCO area in Rasau Kerteh has not been given a definite designation.

Table 8.22 Summary of existing and committed agricultural projects

	Acres (Gross)
Developed and partially developed (Table 6.1)	96,688
Sited committed projects (Table 6.4)	84,710
Committed projects sited by Consultants (Table 8.21)	54,193
TOTAL	235,591

Table 8.23 Classification of existing and committed agricultural projects by management type, sector and crop

	Acres (Gross)		
Type	**Public**	**Private**	**Total**
Estate	55,297	95,656	150,953
Settlement Scheme	67,524	–	67,524
Research	2,634	–	2,634
Other	4,480	10,000	14,480
TOTAL	129,935	105,656	235,591
Crop			
Oil Palm	102,441	79,431	181,872
Rubber	20,380	6,658	27,038
Other	7,114	19,567	26,681
TOTAL	129,935	105,656	235,591

The cropping pattern is dominated by oil palm which accounts for 77 percent of the committed area. Rubber is about 10 percent and other crops about 13 percent. However, the area under other crops includes the two acres in Rasau-Kerteh presently allocated to SEDC and NADEFINCO which total 14,480 acres. The Consultants will recommend that these areas be re-assigned to FELDA and they will thus be additional to the oil palm acreage. The area under other crops will thus be reduced to 12,201 acres, or about 5 percent of the total committed area. This indicates a very low proportion of land in diversification crops (i.e. crops other than rubber and oil palm) and a low proportion of land under rubber on an estate scale.

The Consultants have identified those areas of land still uncommitted which have potential for large scale agricultural development. This land is nearly all in Development Potential Classes A and B, which are classes containing soils mostly in Soil Suitability Classes 1G, 1g, 2G and 3G. Land in other Soil Suitability Classes has various constraints limiting development on a large scale and these are indicated in the Development Potential Classification (Section 8.2).

For the purposes of planning, therefore, the balance of land remaining in Development Potential Classes A and B totals 84,968 acres of which 46,748 acres (55 percent) is in Class A.

8.6.4 Projects for immediate implementation recommended by the Consultants

(i) Extension of the FELDA Rasau-Kerteh area

The Consultants recommend additional acreage for FELDA in Rasau-Kerteh to consist of Development Area 6, Area 109 (at present allocated to SEDC) and Area 110 (at present allocated to SEDC/NADEFINCO). Together these areas total 16,240 acres and have an area suitable for oil palms (soil in Class 2G) of about 8,000 acres. It is proposed that this should be developed in two phases, Area 6 and 109 in 1977 and Area 110 in 1978. About 6,000 acres of Area 110 is unsuitable for oil palm being on soil in Class 3d, 3G, 3cG and steep land. For the time being it is not recommended that this area should be developed. The acreage and planting programme for the proposed extension to FELDA Rasau-Kerteh is shown in Table 8.24 below.

Table 8.24 Proposed Extension to FELDA Rasau-Kerteh

	Year of Development			
Area No.	1977	1978	Total Acres	Net Planted Acres
6	1,760	–	1,760	1,320
109	4,480		4,480	3,680
110	–	4,000[1]	4,000	3,000
TOTAL	6,240	4,000	10,240	8,000

[1] Gross area of land suitable for oil palms

The proposal to increase the area for FELDA is justified on the grounds that settlement schemes seem, in the Consultants view, to meet better the objectives of the NEP than estate type projects. FELDA is the only agency with a proven record of success in this field, and there is a big demand for smallholdings on FELDA schemes from natives of Trengganu. In fact there are at present 1,239 FELDA settlers in Trengganu, mostly on oil palm schemes and the schemes being developed will provide a further 2,015 lots (of 14 acres). At present, processed applications number 3,400 and the existing programme will still leave a shortfall of more than 1,000 applicants. The proposed extension would provide an additional 570 lots. It would also increase the size of the Rasau-Kerteh scheme to 23,000 acres at which level its population can sustain a "district town" type of settlement which provides a higher level of amenities than any other settlement yet established on a FELDA scheme. The extended scheme will also be able to support and fully utilise a large palm oil mill. The proposed extension is named FELDA Rasau-Kerteh Extension in Table 8.25.

The SEDC, who presently hold Area 109, have no firm plans for developing it and are in any case reported to be curtailing their agricultural expansion programme, NADEFINCO, who have Area 110 as the remaining acreage to be planted under their long standing agreement with the State Government, have likewise shown no sign of developing it and more than half of it is unsuitable for oil palm (and most other crops). If past agreements must be honoured, other areas of similar potential can be allocated to both parties. In the case of NADEFINCO, Area 16 (designed for OPE – 2) would be conveniently close to their present milling facilities at Padang Kubu. However, the Consultants suggest that the State Government should review its agreement with NADEFINCO to evaluate its past achievements and to estimate its relevance in view of the present development programme and the objectives of the NEP.

(ii) Extension of Area for Ladang Tenggara Estate

There are two small Development Areas (27 and 28) next to the northern boundary of Ladang Tenggara Estate (119). These areas will only be accessible through the estate and it is proposed that they be offered to the estate as additional acreage. Area 27 is 832 acres on Class 2G soil and Area 28 is 313 acres on Class 1G soil. The additional of this area of 1,145 gross acres will increase the plantable land on the estate by about 850 acres.

In return for this, the Consultants suggest that the estate should set aside an equivalent area of land on Class 1 soil which, according to the Soil Suitability Map, lies on the western boundary of the estate and will be bisected by the new Jerangau-Jabor road. This area should be developed as a cocoa project following the results of a pilot project. It is understood that LKTT have a share in the equity of Ladang Tenggara and the Authority could arrange the land transfer and the area under oil palms would remain the same.

The area of Class 1G soil involved is free of logging constraints this year and it is therefore recommended that a 50 acre pilot project be started at once with a view to commercial implementation in five years time. LKTT could participate in this with either a public or private sector investor with expertise in cocoa production.

8.6.5 Summary of Proposals for the First Decade Development Programme

Table 8.25 brings together the whole programme for the period 1971 – 1980, incorporating all existing and committed development areas, as well as the changes in allocation recommended above. The gross developed area by 1980, including the MARDI Field Experimental Station at Jerangau (see sub-section 8.6.6 below) and the proposed new FES of 1,645 acres in Development Area 26, is programmed to reach 231,351 acres, equivalent to 172,121 planted acres.

Table 8.25 Trengganu Tengah: Agricultural Development Programme, 1974 – 1980

Development area (see Fig. 8.1)		Crop	Gross Acres: Acreage at 31 Dec. 73	1974	1975	1976	1977	1978	1979	1980	Planted Acres: Gross Area	Planted Area	Type
101	FELDA Bukit Bading	Oil palm	5,766								5,766	5,489	Settlement scheme
106	FELDA Jerangau	Oil palm	8,405								8,405	6,649	Settlement scheme
105	FELDA Jerangau Barat	Oil palm	2,998		3,442						6,420	3,899	Settlement scheme
114	FELDA Seberang Tayor	Rubber	2,438								2,438	1,622	Settlement scheme
122	FELDA Neram I	Oil palm	10,290								10,290	5,798	Settlement scheme
107	SEDC Bukit Besi Estate	Rubber	12,697	4,600	600						17,897	15,380	Estate
103	MARDI FES Jerangau	Research	989								989	675	Research station
102	Jerangau Estate	Cocoa	1,200								1,200	999	Estate
104	Landas Estate	Cocoa	1,439								1,439	980	Estate
112,115,116,117	TDMB/NADEFINCO	Oil palm	27,392								27,392	24,904	Estate
118	Chenderong Concession	Oil palm	3,597								3,597	3,000	Estate
123	Jabor Valley Estate	Oil palm) Rubber)	9,810	1,000							10,810	4,152 1,574	Estate
108	FELDA Rasau Kerteh	Oil palm	–	6,667	6,667	7,966					21,300	15,000	Settlement scheme
6,109,110	FELDA Rasau Kerteh Extension	Oil palm	–				6,240	4,000			10,240	8,000	Settlement scheme
121	FELDA Neram II	Oil palm	–	6,720							6,720	3,900	Settlement scheme
111	RISDA Ulu Paka	Oil palm	–	4,000	6,667	6,667	6,666				24,000	18,000	Estate
113	FELCRA Ulu Chukai	Oil palm	–	–	1,340	1,340	1,340	2,120			6,140	4,000	Youth scheme
119	Ladang Tenggara	Oil palm	–	1,250	1,500	1,500	1,500	1,500	1,500	2,040	10,790	7,500	Estate
120	Private Estate	Annual crops	–		200	400	680				1,280	1,000	Estate
13	OPE – 1	Oil palm	–				1,350	2,675	2,675		6,700	5,000	Estate
16	OPE – 2	Oil palm	–		1,350	2,675	2,675				6,700	5,000	Estate
17	OPE – 3	Oil palm	–			1,350	2,675	2,675			6,700	5,000	Estate
19	OPE – 4	Oil palm	–		1,350	2,675	2,675				6,700	5,000	Estate
23	OPE – 5	Oil palm	–			1,350	2,675	2,675			6,700	5,000	Estate
24	OPE – 6	Oil palm	–				1,350	2,675	2,675		6,700	5,000	Estate
25	OPE – 7	Oil palm	–		1,350	2,675	2,675				6,700	5,000	Estate
5	Private Estate	Grass protein	–		450	1,100	850	150	2,698		5,248	3,000	Estate
34	Private Estate	Sago	–	100	100	100	100				400	400	Estate
26	MARDI FES	Research	–			500	500	645			1,645	1,200	Research
	TOTAL		87,066	24,337	24,996	30,298	33,951	19,115	9,548	2,040	231,351	172,121	

8.7 The Agricultural Plan – Research Programme in the Period to 1980

8.7.1 The Need for Research

The Consultants have selected a number of crops other than rubber and oil palm which show some potential for diversifying the agricultural pattern of Trengganu Tengah. However, much work remains to be done in testing these crops under local conditions and solving some of the present problems known to exist as well as identifying new ones. The prime responsibility for this work must rest with the MARDI, and the research programme must be well advanced during the period up to 1980.

MARDI has assumed responsibility for research in all fields of agricultural and fisheries except rubber. The Institute has undertaken considerable research commitments in other development areas such as Johor Tenggara and Pahang Tenggara where it is setting up two new research stations. In addition, MARDI has ongoing research programmes on its existing experimental stations throughout Malaysia. The Institute is currently short of scientific staff because many of its newly appointed personnel are still undergoing academic training.

In Trengganu Tengah, MARDI has a Field Experimental Station (FES) at Jerangau where work is currently concentrated on breeding and agronomic trials on oil palm. It has already been suggested [131] that the full potential of this station should be realised if a rapid programme of trials on diversified crops is to be put into effect. Further, examination of the facilities at Jerangau and the land available confirm this opinion. There is at least 300 acres of land, some still under forest, which could be utilised for trials. If the FES Jerangau is to make an immediate contribution to a diversified cropping programme for Trengganu Tengah it will be necessary to draw up a programme with priorities. This should be done in consultation with the LKTT agricultural committee. If such a programme is to be effective it will be necessary for MARDI to appoint at least one scientific staff member to be resident at Jerangau and housing facilities are available. The following crops are recommended for immediate investigation: –

(i) **Cocoa:** Trials of Sabah hybrid/Upper Amazon material to determine resistance to Die-Back Disease. Trial to determine costs and benefits of applying lime to the crop. Minimum running time will be five years.

(ii) **Coconuts:** Trials of available varieties of coconuts including Malaysian Talls, Malaysian Dwarfs, and West African hybrids to determine fertiliser programmes and yield potential. Minimum running time will be ten years.

(iii) **Fruit crops:** A collection of local and foreign types of citrus should be started for observation, suitability, scurce of planting material, identification and control of pest and disease problems and liming and fertiliser trials. There is already some citrus on the station which could be incorporated in this programme. Minimum running time will be 6 to 7 years. Collection and propagation of commercial varieties of bananas, papaya and pineapples for the same type of programme as citrus. Minimum running time will be three years.

Other fruit crops including ciku, soursop, jackfruit, durian, mangosteen, duku/langsat, indian mango, rambutan and guava should be collected to test Malaysian and other varieties for local suitability, identification and control of pest and disease problems and to serve as a source of planting material. Running time five to ten years according to type of fruit tree.

(iv) **Pasture grasses and legumes:** A collection of pasture grasses and legumes should be made and yield trials started to determine best species, optimum mixtures and length of economic life under cut and carry regime. If livestock are introduced on a limited scale, performance under grazing (especially during monsoon period) should be studied. Minimum running time five years.

(v) **Annual crops:** It is not considered that annual cash crops are likely to be grown on an extensive scale in Trengganu Tengah but these crops could be grown by smallholders on a seasonal basis on alluvial terrace soils. If a suitable trial area can be found, limited trials of maize, groundnuts, soyabeans and other field crops can be put down to test varieties, feasibility of production during the monsoon season and for seed production of approved varieties for distribution to local farmers. Minimum running time three years.

(vi) **A botanical collection** of economic trees should be established for long term observation. This should include representative species of all tree crops grown in Malaysia and important species grown elsewhere in the humid tropics. Trials of sago palm can be started in swampy areas. This is a long term continuing programme.

(vii) **Livestock:** The size of the FES Jerangau would limit the extent of livestock trials which are most likely to be concerned with cattle. However, to test pasture species under grazing conditions cattle could be borrowed from the nearby MAJUTERNAK project. In the longer term, extensive livestock trials would require the establishment of a new research station. Research into livestock other than cattle is not considered a priority for Trengganu Tengah.

The existing crop acreages at FES MARDI are given in Table 8.26 and a suggested allocation of the unoccupied land for the above programme is given in Table 8.27.

The programme suggested (Table 8.27) could be started at once, and providing suitable planting material is available all trials could be under way by mid–1975. Some trial results would be forthcoming during the period to 1980, and from the longer term trials during the second development decade (1981 – 1990).

Table 8.26 MARDI FES Jerangau

Present Acreage

Crop	Area (Acres)
Oil palm	281
Cocoa	44
Durian	20
Coconuts	2
Fruit Trees	32
Sub-total (planted acres)	379
Houses, buildings, etc.	60
Swamp	156
Unfelled Jungle	394
Sub-total	610
TOTAL (gross acreage)	989

Table 8.27 MARDI FES Jerangau

Suggested Acreages for New Programme

Crop	Trial	Area (Acres)
Cocoa	Disease resistance, (Liming trial on existing mature areas)	30
Coconuts	Variety trials	30
Fruit Crops	Citrus; varieties, fertiliser, etc.	30
	Bananas; varieties, fertiliser, etc.	5
	Papaya; varieties, fertiliser, etc.	3
	Pineapple; varieties, fertiliser, etc.	2
	Other fruit crops	50
Pastures	Grass and legume plots	10
	Grazing area	40
Annual Crops	Field Crops	5
	Vegetables	5
Botanical Collection		50
TOTAL:		260 acres

If it is felt that MARDI requires a larger area for trials there are several ways in which this could be made available. The Institute has already put up a proposal for a 2,500 acre research station in Trengganu Tengah to be developed from 1975, at an estimated cost of about $4 million. In the Consultants' opinion it would be more effective to concentrate the scarce technical manpower resources on making full use of Jerangau FES first but in the longer term another agricultural research station for the heavy monsoon area (i.e. Trengganu and part of Kelantan) may be worthwhile. In the short term, a smaller station (500 – 1,100 acres) could be established in the southern half of the development area to obtain data relevant to conditions there, and a site has been selected for this in Development Area 26.

It is relevant to mention here that in addition to the research work being undertaken in agriculture by MARDI and other public sector bodies (RRI, FELDA etc.) the private sector has for many years played a crucial role in this respect. Although these efforts have in the main been concentrated on rubber and oil palms on the western side of the country there is also an increasing amount of work being done on other crops. In Trengganu Tengah, the private sector has played the leading role in pioneering the growing of cocoa in the area and this experience should be drawn on to the fullest extent possible.

8.7.2 Pilot Projects

In order to increase the speed of introduction of crops other than rubber and oil palms the Consultants suggest that a number of pilot projects on diversified crops should be initiated as soon as possible by suitably qualified developers in the public and private sectors. These developers would then be given the option to continue development to a commercial level once the feasibility of their project has been established. These pilot projects would to some extent relieve the MARDI of sole responsibility for investigating the possibilities for diversified cropping but the Institute should be invited to take an active role in advising and observing progress on them.

(i) Cocoa Pilot Projects

Two pilot projects, each of 50 acres, are recommended, one in Area 31 and the second on Ladang Tenggara Estate (119). Both areas are on Class 1G soil. In both areas the crop would initially be planted under bananas, but at later date permanent shade trees should be planted and a special study made of the optimum shade regime required. Planting material, resistant to Vascular Streak Die-Back disease should be obtained from the private sector cocoa estates at Jerangau and it is suggested that this private sector company should be invited to cooperate technically on both projects. The pilot project in Area 31 could be undertaken by a private sector developer in conjunction with FAMA who have interests in processing and marketing cocoa (and coconuts – see the following paragraph). The pilot project on Ladang Tenggara would be undertaken by either a public or a private sector agency and LKTT should take a particular interest in its implementation. The Ladang Tenggara project could start at once and the Area 31 project in 1975 by which time logging operations will be completed.

(ii) Coconut Pilot Projects

The supply of seed nuts of West African hybrid coconuts is limited at the present time. It is understood that a private sector plantation group on the West Coast of the country has some material in limited quantities. Two pilot projects using imported hybrids and local varieties are suggested, one in Area 1 in the north of Trengganu Tengah and one in Area 29. Each pilot project should be at least 25 acres initially and acreage can be increased as more planting material becomes available up to a total area of 100 acres each. Area 1 is available at once having been cleared of commercial timber. Area 29 will be cleared in 1975. It is recommended that FAMA be invited to cooperate with the private sector in Area 29 and that FELDA been invited to conduct the pilot project in Area 1 which could ultimately lead to a diversification project bringing benefits to the settlers on the Bukit Bading scheme.

The primary objective of these pilot projects is to test the range of planting material available in two different places in the development area. Ultimately, the possibility of intercropping would be investigated either with cocoa or with pasture grasses for grazing by cattle.

(iii) Fruit and Vegetable Pilot Project

Development Area 30 contains, in its southern portion, about 1,000 acres of Class 1G soil and in the north more than 2,000 acres of Class 2G soil. Its location, near the growth points of Tanjong Gelang port and the town of Kuantan, make it a potentially suitable area for the production and supply of fresh fruit and vegetables to these urban areas. The Consultants suggest that FIMA would be the most suitable agency to start a pilot project on growing vegetables on the Class 1G soils and perennial fruit trees on the Class 2G soils. An area of 640 acres of the Class 1G soils in the southern tip of Area 30 will be released from logging in 1974. The remaining area will be released annually in 800 acre lots under a sawmill agreement starting in 1975. The pilot project, which should be 50 acres at first, should aim initially at establishing the feasibility of growing a range of vegetables and quick growing perishable fruits (such as papayas, pineapples and bananas) for the local market on a year round basis. The ultimate aim would be to establish a nucleus market garden and orchard with central packing (and possibly processing) facilities around which small-holder growers would be grouped on land subleased from the FIMA. It is understood that this agency is carrying out a project along these lines in Johor to supply the markets for fresh vegetables in Singapore and Johor Baharu.

Before embarking on this pilot project, the FIMA should prepare a feasibility study (See Appendix F) to investigate the present and future demand for fresh vegetables and fruits in the Kuantan area and the range of crops required to supply this demand. There should also be a clear statement of the immediate trial programmes and the availability of skilled technical and managerial staff needed to implement the pilot project. Depending on the degree of success of the pilot project it can be gradually expanded to a commercial level and some of the areas initially cleared and planted could be turned over to smallholders on an annual lease basis.

(iv) Fruit Pilot Project

In order to establish at an early date an orchard for the future supply of fruit and planting material to the development area, the Consultants suggest a pilot project in Area 3 which is on the eastern boundary of the FELDA Jerangau settlement scheme. This pilot project could be implemented and controlled by FELDA and MARDI and it would initially consist of a collection of the best available clonal and varietal planting material of several popular local fruits. Those recommended are ciku, soursop, jackfruit, lime, pomelo, sweet orange, durian, duku/langsat, rambutan, guava and mangosteen. The area is on Class 2G soil and should be suitable for this range of crops. Initially 10 acres of each species should be planted and the pilot project would thus cover about 110 acres. Ultimately the whole of Area 3 (384 planted acres) could be planted to fruit trees which would supply the northern half of Trengganu Tengah and the coastal towns to the east. The close cooperation of MARDI would be required to ensure that the planting operations and subsequent maintenance are properly carried out and to distribute information from the pilot project to other fruit growing projects in the area.

(v) Citrus Pilot Project

The growing of citrus in Malaysia has not so far been attempted on a large scale. The more refined citrus types such as sweet oranges and grape fruit are imported and the locally produced fruit is generally poor in quality. MARDI has expressed the opinion that citrus can be grown successfully in Trengganu Tengah and in order to confirm this view the Consultants recommend a small pilot project for this crop. The pilot project should be located in Area 18, on Class 3G soil. The terrain is rolling but the soil is well-drained and with adequate conservation measures (terracing) it should be suitable for the crop. A wide range of citrus types should be planted to ascertain suitability and to identify problems. The pilot project should be 50 acres in area and it is recommended that a private sector investor with the necessary specialist knowledge should be invited to participate. If the indications from the pilot project are good, then a citrus estate could be developed on the remainder of the area. Area 18 will be released after logging in June 1975 and it is recommended that clearing of the pilot area is done immediately after that. In the meantime planting material should be collected and a small nursery should be started in the locality.

(vi) Summary of Pilot Projects

The pilot projects recommended for implementation in the period up to 1980 are summarised in Table 8.28.

The Consultants recommend that the Development Authority notifies the public and private sector developers who might be interested in the opportunities available to them. This should be done as soon as possible to allow time for plans to be drawn up and the necessary personnel to be assembled.

Table 8.28 Trengganu Tengah: Proposed Agricultural Pilot Projects

Area No.	Crop	Acres	Developer	Planning starts
1	Coconuts	25+	FELDA	1974
3	Fruit trees	110	FELDA/MARDI	1974
18	Citrus	50	Private	1975
29	Coconuts	25+	FAMA/Private	1975
119	Cocoa	50	Private/Public	1974
30	Fruit and Vegetables	50	FIMA	1975 following Feasibility Study 1974
31	Cocoa	50	FAMA/Private	1975

8.8 The Agricultural Plan, 1981 to 1990

8.8.1 Introduction

From 1980 onwards most of the development area will be served by all-weather roads. This will greatly facilitate the extraction of timber and access to sites for agricultural development. The pace of development during this period will necessarily be slower than in the previous decade because less land will remain to be opened up and, initially, much of the available manpower will be engaged as permanent labour on the new estates or as smallholders on the settlement schemes. In order to fully utilise the existing and new infrastructure and to concentrate development effort around the new settlement areas the Consultants' proposals for new development projects are based first of all on those development areas which will be served by the Jerangau-Jabor road and its feeder roads. These development areas are dealt with in order from north to south starting with Area 1.

8.8.2 Priority Development Areas after 1980

(i) Development Areas 1, 2, 3 and 4 – diversified agricultural projects at Jerangau

These four areas are considered together because they are all close to the existing FELDA schemes in the Jerangau area and will contribute to the population based there.

The Consultants believe that developments in these areas should be planned to bring some benefits to the smallholders in the FELDA Bukit Bading and Jerangau schemes. These people will be the only FELDA settlers in Trengganu with the original size (8 acre) holdings which by the 1980's will be declining in yield.

Area 1 has been proposed for a pilot project on coconuts and it is assumed that the whole area will be planted to this crop eventually. Indications of the suitability of the area for coconuts should be available by 1980 and this is taken as Year 0 of the development programme. Planting in two phases is proposed. During the early years of growth it is proposed that short term fruit and food crops such as pineapples, papayas, bananas and vegetables should be grown, possibly as a part time occupation by FELDA smallholders and other people in the area without land of their own. Depending on the results of research work on pasture grasses and on the progress of cattle production the long term development of this area could be directed towards a coconut and cattle project. Revenue from the project would accrue during the early years from the fruit and vegetables crops, then from the coconuts and after eight years from the cattle and coconuts. At a later date, it is recommended that a feasibility study for this type of scheme be prepared.

Area 3, already proposed as a pilot project for a wide range of fruit trees, would be fully planted in 1981 and 1982 to a commercial orchard for the supply of high quality fruits to the local markets. The seasonal requirement for labour on the two fruit areas could be met by the smallholders from the nearby FELDA schemes. This requirement for harvesting labour would occur in the months of May – July, which is an off-peak period for harvesting oil palm fruits.

Area 2. Depending on the success of the pilot fruit project in Area 3, this area could be planted as a commercial orchard project using planting material from the most successful species and varieties of fruit. Fruits suitable for canning could be grown and processed in a cannery located in the sub-regional centre, Community C (see Chapter 12). Suitable fruits would be jackfruit, rambutan and guava. Development of Area 2 is recommended in three phases to start in 1983 following completion of development in Area 3.

Area 4 is suggested for another coconut project which might ultimately be undercropped with pasture for a grazing scheme similar to that proposed for Area 1. Development is programmed to start in 1980 and should be in two phases. Ultimately this project would be subdivided into small farms for a mixed cropping system of cattle and food crops under coconuts. By the time the undercropping becomes possible (late 1980's) FELDA should have enough experience of mixed crop smallholdings to enable them to undertake the project as a pilot project.

To ensure that the settlers on FELDA's Bukit Bading and Jerangau schemes can be given an opportunity to benefit from development in Areas 1, 2, 3 and 4 and because of the need for access to areas 2 and 3, it is recommended that FELDA be invited to play the leading part in developing these areas. Private sector interests could also be involved and agencies such as MAJUTERNAK could be invited to participate if, for instance, a cattle grazing scheme was proposed in Area 1 or Area 4. All four areas will require a small permanent labour force, supplemented during peak periods by casual labour as described. Management capability should be provided by

FELDA under the overall direction of an Area Manager who will be responsible for the three FELDA settlement schemes at Jerangau and the development of the four new areas described above.

(ii) Development Area 7 – possible site for cattle project

This area is on Class 2G soil. It will be near to the feeder road F2 and will thus be accessible by 1980. It lies within the Dungun Forest Complex area and boundaries have yet to be defined.

The Consultants suggest that Area 7 should be offered to MAJUTERNAK as the site for a small beef cattle project starting in 1981. By this time MAJUTERNAK will have gained a great deal of local experience on their Kuala Brang project which will be directly relevant to Trengganu Tengah. Development of the area should be phased over three years. Because of the nature of the terrain careful attention will have to be paid to soil conservation measures and the steeper slopes will have to be fenced off and planted to permanent tree crops such as coconuts.

Produce from this scheme could supply some of the demand for beef in the development area.

(iii) Development Areas 8, 9 and 10 – A FELDA settlement scheme

These three areas have a Development Potential Class A. They are located along the upper reaches of the Sungei Dungun and are at present only accessible by river. The present planned feeder road (F – 1) will extend only as far as Kampung Kuala Jengai, on the river, north of these areas. Ultimately, an extension of F1 will extend into Area 8 and will continue up the valley to serve Area 9 and the existing settlements on alienated land. This infrastructure will not be constructed until after 1980 and until it is, development of the area is not practicable. Furthermore most of the three areas are within the forest allocation for the Dungun Wood-Based Industries Complex, and the timber will thus have to be fully exploited and permanent boundaries agreed before agricultural development can start.

The three areas are remotely located and for this reason could be developed with low labour-intensity schemes. However, if the benefits of modern infrastructure and better living conditions are to reach the existing population in the upper reaches of the Dungun, it is necessary to propose projects with enough manpower requirement to sustain a sizeable settlement. Therefore, a FELDA settlement scheme based on oil palms is proposed to cover all three areas. A new palm oil mill will be built in the new settlement which will be sited near Kampung Pasir Raja. The new scheme is tentatively named FELDA Pasir Raja Scheme. It will have a planted area of more than 16,000 acres which, under present standards will provide holdings for about 1,150 settlers, some of whom will undoubtedly come from the nearby kampungs along the river. The project is to be developed in five phases starting in 1982 (Table 8.29).

Table 8.29 Proposed FELDA Pasir Raja Settlement Scheme

Area	1982	1983	1984	1985	1986	Total acres Gross	Planted
8	2,750	4,000	4,000	2,069		12,819	9,614
9	1,250					1,250	938
10				1,931	5,781	7,712	5,784
	4,000	4,000	4,000	4,000	5,781	21,781	16,336

(iv) **Development Area 12 — A cocoa and coconut estate**

This area is on Class 2G soil and lies along the projected feeder road F1/F2. It is near the proposed sub-regional centre, Community C (Chapter 12).

Pilot projects have been proposed for cocoa and coconuts and by the early 1980's it should be possible to forecast the prospects for these crops in Trengganu Tengah. If this forecast is favourable, coconut interplanted with cocoa is recommended for this area. Development should start in 1980 and is phased over three years. The coconuts should be planted first and in eight years the cocoa will be interplanted. During the early years of development intercropping with fruit and vegetables is recommended. This project will require a high level of management to ensure ultimate profitability. It is recommended that it is offered to a private sector developer, with the necessary experience.

(v) **Development Area 14 — A mixed fruit estate**

This area is at present within a proposed Forest Reserve area but it could be released and cleared of commercial timber by 1980. Because of its proximity to the new sub-regional centre (C), this course of action is recommended. A fruit growing project is recommended, initially to ensure a supply of fresh fruit to the new sub-regional centre and other nearby settlements. Development should start in 1980 with an area of 200 acres and would continue in 200 acre phases over the decade.

While this project should be aimed primarily at producing fruit for local consumption it could also have a nursery producing planting material of fruit and ornamental trees for distribution to householders and public amenity projects in the new towns. The Consultants recommend that LKTT is involved with this project to ensure timely clearance of the land by loggers and to guarantee reasonably priced supplies of fruits to the new markets. A private sector company could be invited to provide this project with management experience and in the long term a small fruit canning industry might be set up in the sub-regional centre to process produce in excess of local market demands from this project and those in Areas 2 and 3.

(vi) Development Area 15 – Extension to NADEFINCO oil palm area

This area lies along the northern boundary of the NADEFINCO oil palm estate. It is on Class 3G soil and as such is marginally suitable for oil palms. However NADEFINCO's present oil palm area is partly on this soil type and reasonable yields are obtained. Earlier in this Chapter (sub-section 8.6.4) the Consultants proposed that NADEFINCO should relinquish their land in Rasau-Kerteh area (110) in favour of FELDA. It is now suggested that Area 18 should be offered in part exchange. If it is developed in 1983 it will help to sustain throughput of the company's large palm oil mill which will be handling a decreasing amount of ffb during the late 1980's and in the 1990's.

(viii) Development Area 18 – A citrus estate

If the pilot project for citrus proposed by the Consultants gives favourable indications, it is recommended that Area 18 should be developed as a citrus estate by a private sector investor. Citrus requires a high level of management and supervision for the production of high quality fruits. Produce would be marketed firstly as fresh fruit with the longer term possibility of canning. The estate should be started in 1982 and developed in four phases. Maintenance of the estate will be done by a permanent labour force and peak labour requirements during harvesting periods could be met by casual labour from the FELCRA Youth Scheme north of Area 18 and by people from kampungs just east of the Trengganu Tengah boundary.

(viii) Development Areas 20, 21 and 22 – Five new rubber estates

These areas are considered together because they are all on Class 3G soil which has been given the Development Potential Class B which is suitable for rubber. Rubber as a smallholder crop, both on FELDA schemes and on alienation schemes, has not been a success in Trengganu. Application of the technology available now and in the immediate future is most effectively achieved on modern estate type projects. The Consultants therefore propose that these areas be developed as rubber estates. To ensure an acceptable distribution of the benefits obtained from the estate system some degree of public sector ownership should be incorporated but given the desirability of developing the estates in the most profitable way possible the emphasis should be on management. In this respect participation of private sector companies with a proven record of success in this field should be sought.

Area 20 Should be developed as an estate in three phases starting in 1981. **Area 21** is large enough to be subdivided into three estates. Each estate will be developed in three phases, the first estate starting in 1980, the second in 1981 and the third in 1982. Boundaries subdividing Area 21 have not been shown by the Consultants. It is suggested that the semi-detailed soil survey now in progress should be completed first to ensure a reasonable distribution of suitable land to each estate. However, since the area will be bisected by the Jerangau-Jabor road direct access to this road should be given to each of the three estates. **Area 22** can be developed as one estate in three phases, starting in 1980. For convenience these five proposed estates are referred to as RU – 1, RU – 2 etc. Details of the proposed phasing of these projects is shown in Table 8.30.

Rubber from the five estates will be processed in a central factory to be located at Community E (see Chapter 12). The new rubber estates will ultimately provide employment for more than 1,600 people.

Table 8.30 **Phasing of Five New Rubber Estates**

Area No.	Estate No.	Year of Development					Total Acres	
		1980	1981	1982	1983	1984	Gross	Planted
20	RU – 1		640	640	640		1,920	1,440
21	RU – 2	666	1,060	1,056			2,782	2,087
	RU – 3		666	1,060	1,056		2,782	2,087
	RU – 4			666	1,060	1,055	2,781	2,085
22	RU – 5	666	1,200	1,274			3,140	2,355
TOTAL		1,332	3,566	4,696	2,756	1,055	13,405	10,054

(ix) Area 29 – A Coconut/Cattle Project

A pilot project for coconuts has already been recommended in this area. FAMA is suggested as a suitable developer. If the indications are favourable the area should be developed in five phases as a high yielding coconut estate starting in 1980. The options for intercropping should be left open but because of its proximity to the Kuantan area the possibility of supplying this and other local markets with fresh produce should not be overlooked. The area might thus be suitable for a small dairy cattle project (under coconuts) to be developed towards 1990. FAMA, in conjunction with private sector interests, would be a suitable development team.

(x) Area 30 – A Fruit and Vegetable Project

A pilot project for fruit and vegetables conducted by FIMA has been proposed for this area. The primary objective is to supply the market in the Kuantan area with fresh produce. It is suggested that this project should be expanded gradually to satisfy demand as it increases. Basically, there should be a nucleus estate developed and managed by FIMA who would then sub-let small areas of about 20 acres to smallholders who would market all their produce through FIMA either as fresh fruit and vegetables or for processing. The first step is to investigate thoroughly the agronomic and economic aspects of growing vegetables in the area, and this should have been achieved by 1980. In this year, therefore, the first phase of the project is planned to start with a gradual increase in area up to 1990.

(xii) Area 31 – A Cocoa Estate

A pilot project for cocoa is proposed for this area which is on Class 1G soil.

This project should be developed by a private sector company with expertise in the growing of cocoa. Development should be phased over three years starting in 1981.

(xiii) Ladang Tenggara Cocoa Estate

In their proposals for implementation during the first development decade (sub-section 8.6.4) the Consultants recommended the addition of Areas 27 and 28 to the acreage of Ladang Tenggara (119) oil palm estate. In return it is proposed that this company should release an area on Class 1G soil in the west of Area 119 with a gross area equal to Areas 27 and 28 (1,145 acres). It is proposed that the cocoa project should be developed by either a public or private investor and LKTT. Development should be phased over three years starting in 1980.

8.8.3. Land with Agricultural Potential to be Reserved for Future Development

(i) Area 11 – To be reserved indefinitely

This small (992 acres) area is on Class 2G soil (Development Potential Class A). It is not accessible at present and will not be served by any of the proposed network of public roads. It lies in the area allocated to the Dungun Complex. The Consultants recommend that it should be left in reserve pending the results of long term research and development on the proposed diversified crops.

(ii) Area 32 – A reservoir of land suitable for rubber

Most of this area, which has Class B Development Potential, lies within the land allocated to the Kemaman Wood-Based Industries Complex. Under present agreements the area cannot be released for development until the year 2,000 and then only in 2,000 acre lots annually. On the basis of present information it has some potential for rubber growing and under this crop would provide employment for more than 2,500 people. However, because of the present constraints to access and the large number of employment opportunities forecast in the development area as a whole, the Consultants recommend that Area 32 should be considered as a reservoir of land for development in the long term, should the need arise.

(iii) Area 33 – An isolated area to be reserved for future development

This area is mostly on Class 2G soil and has a Development Potential of Class A. It is west of Area 32 and quite inaccessible by present or planned all-weather roads. It lies within the area reserved for the Kemaman Complex and is therefore only available for development after 25 years. If it is developed, the area (5,000 acres) would not be able to support enough people to justify a modern settlement and it would therefore be served in this respect by town E. In view of this, a project with low manpower requirement would be most suitable, and subject to further investigation, the Consultants recommend that it be regarded as a possible site for a cattle scheme to be developed after the end of the present development period.

8.8.4 Summary of Proposals for the Second Decade

Although the second decade of development has been defined as the period from 1981 to 1990, the Consultants have proposed some new projects to start in 1980. At the end of the first decade, opening of areas for development decreases and the addition of more development projects starting in 1980 will not be affected by forestry or labour constraints.

Tables 8.31 and 8.32 summarise the developments which are programmed for the period 1981 to 1990. Projects for implementation in the decade account for a gross area of 55,716 acres, all on land with development potential Class A and B. Analysis of the cropping pattern (Table 8.31) shows that diversified agricultural projects make up of 33 percent of the area, compared with earlier developments which were dominated by oil palm projects. The public sector agencies are to play a major role in implementing the new projects, but the private sector has been given a chance to bring its expertise in estate agriculture to Trengganu Tengah

Table 8.31 Agricultural Projects Proposed for 1980 – 1990 by Crop and Sector (Area in gross acres)

	Public	Private	Total	Percent
Oil palm	21,781	2,208	23,989	43
Rubber		13,405	13,405	24
Coconuts	4,422	2,771	7,193	13
Cocoa		1,985	1,985	3
Fruits	5,401		5,401	10
Citrus		1,107	1,107	2
Vegetables	1,100		1,100	2
Cattle	1,536		1,536	3
TOTAL	34,240	21,476	55,716	100

Table 8.32 Proposed Agricultural Development Projects, 1980 – 1990

Development area	Crop	Sector	Developer	Acres 1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Gross	Planted	Type
1.	Coconuts	Public	FELDA	500	524										1,024	768	Estate
2.	Fruits	Public	FELDA				300	300	308						908	681	Estate
3.	Fruits	Public	FELDA		250	262									512	384	Estate
4.	Coconuts	Public	FELDA	600	744										1,344	1,008	Smallholders
7.	Cattle	Public	MAJUTERNAK		500	500	536								1,536	1,152	Estate
8.	Oil Palm	Public	FELDA			2,750	4,000	4,000	2,069						12,819	9,614	Settlement scheme
9.	Oil Palm	Public	FELDA			1,250									1,250	938	
10.	Oil Palm	Public	FELDA						1,931	5,781					7,712	5,784	
12.	Coconuts/ Cocoa	Private	–	666	1,052	1,053									2,771	2,078	Estate
14.	Fruits	Public/ Private	LKTT and Private	200	200	200	200	200	200	200	270				1,670	1,253	Estate
15.	Oil Palm	Private	NADEFINCO				2,208								2,208	1,656	Estate
18.	Citrus	Private	–			200	300	300	307						1,107	830	Estate
20.	Rubber	Private	–		640	640	640								1,920	1,440	Estate
21.	Rubber	Private	–	666	1,726	2,782	2,116	1,055							8,345	6,259	Estate
22.	Rubber	Private	–	666	1,200	1,274									3,140	2,355	Estate
29.	Coconuts	Public	FAMA	400	400	400	400	454							2,054	1,541	Estate
30.	Fruits and Vegetables	Public	FIMA	200	200	200	200	200	400	400	400	400	400	411	3,411	2,558	Estate/ smallholder
31.	Cocoa	Private	–		200	300	340								840	630	Estate
119. (1)	Cocoa	Public/ Private	LKTT/PVT	200	300	645									1,145	859	Estate
	Sub-total			4,098	7,936	12,456	11,240	6,509	5,215	6,381	670	400	400	411	55,716	41,788	
	Areas To Be Left Undeveloped During Planning Period																
11.															992	744	
32.															21,500	16,125	
33															5,000	3,750	
Sub-total															27,492	20,619	
TOTAL															83,208	62,407	

(1) In exchange for Areas 27 and 28 see text.

8.9 The Agricultural Plan, Summary 1971 to 1990

8.9.1 Gross Acreages

The agricultural development plan, as set out in Sections 8.6 to 8.8 and tabulated in Tables 8.25 and 8.32, comprises a total gross area of 287,067 acres, including those areas already developed or committed. Of this area 231,351 acres (or 81 percent) is expected to be developed by 1980 and the remaining 55,716 acres will be developed between 1980 and 1990. A further 27,492 gross acres of potential agricultural land will then remain within Trengganu Tengah (Sub-section 8.8.3).

Table 8.33 below summarises these gross acreages, broken down by crop, by public and private sector and by management type. The public sector is to take the leading role in implementing development, and 60 percent of the public sector projects will be settlement schemes, all except one implemented by FELDA. The private sector enterprises are all estate type projects, but as has been indicated earlier, ownership of some of these estates will be shared with the public sector agencies; the LKTT is already holding equity in some of the private sector projects. Oil palms still dominate the cropping pattern accounting for 75 percent of the total area but rubber now accounts for 14 percent of the acreage and diversified crops for 11 percent, thus meeting the target suggested earlier in this Chapter.

Table 8.33 Agricultural Development 1970 – 1990 by Sector, Management Type and Crop

Gross acres			
Type	**Public**	**Private**	**Total**
Estate	66,412	117,132	183,544
Smallholder	100,889	–	100,889
Research	2,634	–	2,634
TOTAL	169,935	117,132	287,067
Crop			
Oil Palm	134,462	81,639	216,101
Rubber	20,380	20,063	40,443
Other	15,093	15,430	30,523
TOTAL	169,935	117,132	287,067

Table 8.34 Trengganu Tengah: Agricultural Development, 1973 – 1980

Development area	Project	Crop	Sector	Agency	Planted acres To 31 Dec. 1973	1974	1975	1976	1977	1978	1979	1980	Total
101	Bukit Bading S.S.[1]	Oil palm	PUB	FELDA	5,489								5,489
106	Jerangau S.S.	Oil palm	PUB	FELDA	6,649								6,649
105	Jerangau Barat S.S.	Oil palm	PUB	FELDA	2,024		1,875						3,899
114	Seberang Tayor S.S.	Rubber	PUB	FELDA	1,622								1,622
122	Neram I S.S.	Oil Palm	PUB	FELDA	5,798								5,798
107	Bukit Besi Est.[2]	Rubber	PUB	SEDC	10,180	4,600	600						15,380
103	Jerangau FES.[3]	Research	PUB	MARDI	379	296							675
102	Jerangau Estate	Cocoa	PVT		999								999
104	Landas Estate	Cocoa	PVT		980								980
112,115,116,117	TDMB/NADEFINCO Estate	Oil palm	PVT		24,904								24,904
118	Chenderong Concession	Oil palm	PVT		3,000								3,000
123	Jabor Valley Estate	Oil palm	PVT		3,152	1,000							4,152
		Rubber	PVT		1,574								1,574
108	Rasau Kerteh S.S.	Oil palm	PUB	FELDA		5,000	5,000	5,000					15,000
6,109,110	Rasau Kerteh S.S. Extension	Oil palm	PUB	FELDA					5,000	3,000			8,000
121	Neram II S.S.	Oil palm	PUB	FELDA		3,900							3,900
111	Ulu Paka Estate	Oil palm	PUB	RISDA		3,000	5,000	5,000	5,000				18,000
113	Ulu Chukai Youth Scheme	Oil palm	PUB	FELCRA			1,000	1,000	1,000	1,000			4,000
119	Ladang Tenggara Estate	Oil palm	PVT			938	1,125	1,125	1,125	1,125	1,125	937	7,500
120	Private Estate	Annual crops	PVT				150	300	550				1,000
13	OPE – 1	Oil palm	PVT						1,000	2,000	2,000		5,000
16	OPE – 2	Oil palm	PVT				1,000	2,000	2,000				5,000
17	OPE – 3	Oil palm	PVT					1,000	2,000	2,000			5,000
19	OPE – 4	Oil palm	PVT				1,000	2,000	2,000				5,000
23	OPE – 5	Oil palm	PVT					1,000	2,000	2,000			5,000
24	OPE – 6	Oil palm	PVT						1,000	2,000	2,000		5,000
25	OPE – 7	Oil palm	PVT				1,000	2,000	2,000				5,000
5	Private Estate	Grass/Protein	PVT				300	500	500	500	1,200		3,000
34	Private Estate	Sago	PVT			100	100	100	100				400
26	FES	Research	PUB	MARDI				375	375	450			1,200
TOTAL					66,750	18,834	18,150	21,400	25,650	14,075	6,325	937	172,121

(1) S.S. = Settlement Scheme
(2) Est. = Estate
(3) FES = Field Experiment Station

Table 8.35 Trengganu Tengah: Agricultural Development, 1980 – 1990

Development area	Crop	Sector	Agency	Planted acres											
				1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Total
1.	Coconuts	PUB	FELDA	375	393										768
2.	Fruits	PUB	FELDA				225	225	231						681
3.	Fruits	PUB	FELDA		188	196									384
4.	Coconuts	PUB	FELDA	450	558										1,008
7.	Cattle	PUB	MAJUTERNAK		375	375	402								1,152
8.	Oil Palm	PUB	FELDA		2,062	3,000	3,000	1,552							9,614
9.	Oil Palm	PUB	FELDA		938										938
10.	Oil Palm	PUB	FELDA					1,448	4,336						5,784
12.	Coconuts/Cocoa	PVT		500	789	789									2,078
14.	Fruits	PUB/PVT	LKTT/PVT	150	150	150	150	150	150	150	203				1,253
15.	Oil Palm	PVT	NADEFINCO				1,656								1,656
18.	Citrus	PVT				150	225	225	230						830
20.	Rubber	PVT			480	480	480								1,440
21.	Rubber	PVT		500	1,294	2,087	1,587	791							6,259
22.	Rubber	PVT		500	900	955									2,355
29.	Coconuts	PUB	FAMA	300	300	300	300	341							1,541
30.	Fruits and Vegetables	PUB)	FIMA	75 75	75 75	75 75	75 75	75 75	225 75	225 75	225 75	225 75	225 75	233 75	1,733 825
31.	Cocoa	PVT			150	225	255								630
119.	Cocoa[1]	PUB/PVT	LKTT/PVT	150	225	484									859
	TOTAL 1980 – 1990			3,075	5,952	9,341	8,430	4,882	3,911	4,786	503	300	300	308	41,788
	Brought forward from Table 8.34 (1973 – 1980)			937											173,121
	GRAND TOTAL 1973 – 1990			4,012	5,952	9,341	8,430	4,882	3,911	4,786	503	300	300	308	213,909

[1] Cocoa estate in exchange for Development Areas 27 and 28 – see text.

8.9.2. Planted Acreages

In any agricultural development area there is always a difference between gross area alienated and the area actually planted. In addition to natural constraints such as hills, gullies,swamps and rivers, allowance has to be made for roads, buildings and other essential infrastructure. On high class land with no obstructions the reduction can be as little as 5 percent.

Because of the generally hilly terrain, numerous water courses and swampy areas in most of Trengganu Tengah the reduction from gross area to planted area has been estimated at 25 percent (i.e. for every 100 acres allocated to a project there will be, on average 75 acres planted). This factor was used in the Pahang Tenggara Study,[1] and is confirmed by experience in Trengganu Tengah.

Using this factor applied to new projects and taking the best available information on the existing projects the agricultural development programme in planted acres from 1973 – 1990 has been summarised in Table 8.34 and 8.35. These two tables correspond to the gross acreage table (Tables 8.25 and 8.32) shown in Sections 8.6 and 8.8.

8.9.3 Cropping Pattern

The programme of development is summarised by crop in Table 8.36. The breakdown of crops within the total planted acreage is oil palm 76 percent, rubber 13.5 percent, and other crops 10.5 percent.

Table 8.36 Agricultural Development Programme, 1973 – 1990 by Crop

Year	Planted Acres												
	Oil Palm	Rubber	Coconuts	Cocoa	Fruits	Citrus	Vegetables	Annual Crops	Grass	Sago	Cattle	Research	Total
1973 (to 31 Dec)	51,016	13,376		1,979								379	66,750
1974	13,838	4,600								100		296	18,834
1975	17,000	600						150	300	100			18,150
1976	20,125							300	500	100		375	21,400
1977	24,125							550	500	100		375	25,650
1978	13,125								500			450	14,075
1979	5,125								1,200				6,325
1980	937	1,000	1,625	150	225		75						4,012
1981		2,674	2,040	375	413		75				375		5,952
1982	3,000	3,522	1,089	709	421	150	75				375		9,341
1983	4,656	2,067	300	255	450	225	75				402		8,430
1984	3,000	791	341		450	225	75						4,882
1985	3,000				606	230	75						3,911
1986	4,336				375		75						4,786
1987					428		75						503
1988					225		75						300
1989					225		75						300
1990					233		75						308
TOTAL	163,283	28,630	5,395	3,468	4,051	830	825	1,000	3,000	400	1,152	1,875	213,909
Percent of Total	76.0	13.5	2.5	1.5	2.0	0.5	0.5	0.5	1.5	–	0.5	1.0	100.0

8.9.4 Development by Agency

The development programme broken down by agency (Table 8.37) shows that by 1990 just over half of all agricultural development projects will be in public sector hands. Of the named agencies in this sector FELDA plays the major role. The Authority was heavily committed before the present study and has its current development programme well in hand. The Consultants' proposals give FELDA additional acreage in Rasau-Kerteh towards the end of the Third Malaysia Plan period (1976 – 1980) and a new project for implementation during the Fourth Malaysia Plan (1981 – 1985). In addition the Authority is given some smaller areas in Jerangau for diversification projects to bring added benefits to the settlers in that area. FELCRA has been given no additional area for its Youth Schemes since the agency has been slow to start on its Ulu Chukai project. However, if sociological studies based on the large large projected number of youths expected to migrate into Trengganu Tengah indicate that this type of project is desirable and the Ulu Chukia scheme is successful, expansion of youth schemes should be considered in the future.

The RISDA Block New Planting Scheme of 18,000 acres (planted) in Ulu Paka is a large estate area by any standard and will require a high level of management to make it a success. It is felt that this area is a more than adequate share for this agency in Trengganu Tengah. The two producing/marketing agencies FAMA and FIMA have each been allocated projects which should be suitable to their particular fields of expertise. Some degree of private sector participation in the projects should be encouraged where specialised knowledge of technical or commercial aspects is required.

The Trengganu SEDC has a large rubber estate at Bukit Besi which is nearly planted already and the Consultants have been advised that the Corporation does not wish to pursue any further developments in direct agriculture. However, it may participate in processing ventures through its industrial sites and canning plants in the State.

MAJUTERNAK has been allocated a small area for a cattle scheme which should be subject to confirmation of suitability by the soil survey team. It should not be developed until the Kuala Brang project has been fully developed and some measure of success has been proved. In the long term there may be other areas in Trengganu Tengah where cattle can be grazed either on open pastures or under coconuts. The agency should collaborate with FELDA in Areas 1 and 4 and with FAMA in area 29 to explore the latter possibility in the future.

The role of MARDI has already been given prominence (Section 8.7). Expansion of the Jerangau FES and the development of a second research facility in the south (Area 26) should give the Insititute adequate space to serve the immediate and longer term needs of the development area.

Although the private sector accounts for most of the remaining acreage (46.5 percent) there are some unnamed public sector agencies in this category and a certain amount of public sector participation in other projects is foreseen. This will be particularly relevant in ensuring that equity is held in trust against future purchase by Bumiputras.

Table 8.37 Agricultural Development Programme 1973 – 1990 by Agency

Year	Planted acres									
	FELDA	FELCRA	RISDA	FAMA	FIMA	MAJUTERNAK	SEDC	MARDI	OTHER[1]	TOTAL
1973 (to Dec. 31st)	21,582						10,180	379	34,609	66,750
1974	8,900		3,000				4,600	296	2,038	18,834
1975	6,875	1,000	5,000				600		4,675	18,150
1976	5,000	1,000	5,000					375	10,025	21,400
1977	5,000	1,000	5,000					375	14,275	25,650
1978	3,000	1,000						450	9,625	14,075
1979									6,325	6,325
1980	825			300	150				2,737	4,012
1981	1,139			300	150	375			3,988	5,952
1982	3,196			300	150	375			5,320	9,341
1983	3,225			300	150	402			4,353	8,430
1984	3,225			341	150				1,166	4,882
1985	3,231				300				380	3,911
1986	4,336				300				150	4,786
1987					300				203	503
1988					300					300
1989					300					300
1990					308					308
TOTAL ACRES	69,534	4,000	18,000	1,541	2,558	1,152	15,380	1,875	99,869	213,909
Percent of total	32.5	2.0	8.5	0.5	1.0	0.5	7.0	1.0	46.5	100.0

(1) This category consists mainly of PRIVATE SECTOR projects but there is a degree of PUBLIC SECTOR participation in some of them.

8.10 Production of Agricultural Commodities

8.10.1 Estimating Production

The principal crops in Trengganu Tengah are oil palm and rubber, and estimates of the future production of these two crops are based on the Consultants' yield estimates shown in Section 8.3. Yield estimates for the other crops are harder to predict since in most cases they are new to the area or the technology proposed (disease free varieties, high yield varieties etc.) is not yet proven. In these cases a fairly conservative estimate of production has been used.

8.10.2 Oil Palm

Production is expressed in tons ffb (Table 8.38) and as a guide to the amount of palm oil and kernels produced, factors of 20 percent and 4 percent respectively of the ffb weight are used. The oil palm projects have been put into nine groups which correspond to the proposed palm oil mills (see Chapter 10). Estimated production for individual projects in each group is given in Appendix E.

Production of ffb will reach its peak in 1991 when an estimated 1.3 million tons will be produced, an eight-fold increase since 1973. The estimated production of palm oil at the end of the planning period will be 260,000 tons and palm kernels more than 50,000 tons.

8.10.3 Rubber

During the first part of the development period rubber production will come from three projects only, SEDC Bukit Besi Estate, Jabor Valley Estate and FELDA Seberang Tayor settlement scheme. After 1987 the new rubber estates proposed by the Consultants will come into production and in 1990 total production of rubber will be 18,167 tons, eighteen times the production for 1973 (Table 8.39).

Table 8.38 Trengganu Tengah: Estimated Oil Palm Production, 1973 – 1990

	Tons ffb by milling group [1]										Oil and kernel outturn (tons)	
Year	I	II	III	IV	V	VI	VII	VIII	IX	Total	Palm oil	Palm kernels
1973	71,699	–	–	90,155	–	–	–	1,900	–	163,754	32,751	6,550
1974	91,342	–	–	167,410	–	–	–	3,299	–	262,051	53,410	10,482
1975	96,685	–	–	211,218	–	–	–	6,842	–	314,754	62,949	12,590
1976	104,125	–	–	237,949	–	–	931	10,071	–	353,076	70,615	14,123
1977	107,949	–	–	249,036	–	–	8,258	13,864	–	379,107	75,821	15,164
1978	115,070	1,500	900	252,036	–	281	26,260	18,791	–	414,838	82,968	16,594
1979	119,955	13,500	8,700	251,136	900	2,889	49,735	24,622	–	471,437	94,287	18,857
1980	126,125	43,500	31,500	251,136	9,000	11,966	73,280	29,460	–	575,967	115,193	23,039
1981	135,313	82,500	67,200	251,136	34,500	31,804	83,320	34,729	–	720,502	144,100	28,820
1982	134,952	128,400	111,900	244,380	77,100	66,286	88,452	36,168	–	887,638	177,528	35,506
1983	135,776	167,700	153,900	237,274	123,900	110,368	87,282	37,668	–	1,053,868	210,774	42,155
1984	132,823	193,500	182,100	231,232	155,400	152,236	87,282	37,082	–	1,171,655	234,331	46,866
1985	130,660	204,900	200,400	226,232	169,500	182,631	87,282	36,456	–	1,238,061	247,612	49,522
1986	128,149	207,900	205,200	223,232	171,900	197,483	87,282	36,185	900	1,258,231	251,646	50,329
1987	125,020	207,000	207,600	216,973	171,000	202,321	87,282	35,865	8,100	1,261,161	252,232	50,446
1988	123,031	207,000	207,000	213,344	171,000	202,790	84,178	35,418	26,100	1,269,861	253,972	50,794
1989	120,051	207,000	207,000	213,264	171,000	202,509	81,484	33,930	49,500	1,285,738	257,147	51,430
1990	118,734	202,000	204,000	211,245	171,000	201,571	77,584	33,304	77,800	1,297,238	259,448	51,890

[1] See Chapter 10 (Table 10.5) for geographical location and Appendix E for production estimates by project.

Table 8.39 Trengganu Tengah: Estimated Rubber Production, 1973 – 1990

	tons DRC				
Year	SEDC Bukit Besi Estate	Jabor Valley Estate	FELDA Seberang Tayor	New rubber Estates Areas 20, 21 & 22	Total
1973	–	714	344	–	1,058
1974	–	853	659	–	1,512
1975	–	760	675	–	1,435
1976	–	780	695	–	1,475
1977	–	800	695	–	1,495
1978	742	820	741	–	2,303
1979	2,153	840	741	–	3,734
1980	4,178	860	782	–	5,820
1981	6,734	880	782	–	8,396
1982	8,497	880	828	–	10,205
1983	9,652	860	828	–	11,340
1984	10,344	850	857	–	12,051
1985	10,731	850	857	–	12,438
1986	10,955	840	824	–	12,619
1987	11,222	840	824	277	13,163
1988	11,530	830	776	1,191	14,327
1989	11,897	830	776	2,742	16,245
1990	12,311	830	730	4,296	18,167

8.10.4 Cocoa

Projected cocoa production shows an increase from 270 tons in 1973 to 1,468 tons in 1990 (Table 8.40). However, more than half the acreage under cocoa in 1990 will consist of the two private sector estates in Jerangau and it is not possible to predict the long term prospects for these estates. No estimate is given of yields of cocoa grown under coconuts. The project proposed for Area 12 will not start to yield cocoa during the development period.

Table 8.40 Trengganu Tengah: Estimated Cocoa Production, 1973 – 1990

	tons dry cocoa		
Year	Existing Estates	Proposed Estates	Total
1973	270		270
1974	330		330
1975	390		390
1976	450		450
1977	510		510
1978	570		570
1979	630		630
1980	690		690
1981	750		750
1982	810		810
1983	850		850
1984	880	15	895
1985	880	100	980
1986	880	255	1,135
1987	880	363	1,243
1988	880	446	1,326
1989	880	520	1,400
1990	880	588	1,468

8.10.5 Coconuts

The future of coconuts as a commercial crop in Trengganu Tengah depends upon the performance of the latest hybrid material in the area. If the hybrid material is not a success then improved varieties of the Malaysian tall could be planted instead. In this case projected yields would be lower than from the hybrids but in conjunction with other crops (cocoa, cattle etc.) a profitable enterprise could still be created. As an indication of the low and high yields which could be expected, two yield projections have been made (Table 8.41), the first to show yields if traditional (tall) types are planted but maintained at a high standard and the second to indicate possible yield from hybrid types. Projected yield figures are taken from the Johor Study. [6]

Table 8.41 Trengganu Tengah: Estimated Copra Production, 1984 – 1990

	tons dry copra	
	Traditional types	Hybrids
1984	–	193
1985	58	1,403
1986	218	3,810
1987	801	6,224
1988	1,708	7,642
1989	2,609	8,303
1990	3,393	8,597

8.10.6 Fruits

There is very little information available on yields of most fruits grown under estate conditions in Malaysia. Yield data from countries outside South East Asia is apt to be misleading because conditions in countries such as the U.S.A., Israel and South Africa reflect the performance of varieties selected over many years and grown under ideal conditions. Meaningful yield projections will have to follow the intensive programme of field research work proposed for Trengganu Tengah. For the purposes of this study a range of yields for the various fruit crops recommended is given (Table 8.42).

Table 8.42 Yield Estimates for Fruits

Fruit	MARDI[1]	GRIST[2]	Pahang Tenggara[3]	South Thailand R.P.S.[4]	Purse-Glove[5]
	tons per acre				
Bananas	3.6 – 7.9	–	2.5 – 3.5	–	4.9 – 18
Papaya	–	–	6.0	–	15 – 30
Pineapple	15.7	4.9	5 – 7	–	15 – 30
Guava	–	–	2.9 – 31	–	7.4 – 24.5
Soursop	–	–	–	–	–
Ciku	–	–	–	–	–
Jackfruit	–	–	–	–	–
Durian	–	–	3.1	3.7	–
Duku/Langsat	–	–	–	–	–
Rambutan	–	–	–	5.0	–
Mangosteen	–	–	–	–	–

(1) Estimates of Costs of Production and Returns for various crops and livestock – MARDI 1974.[79]

(2) Grist D.H. Malayan Agriculture 1950 quoted in Pee Teck Yew[35] A Statistical Source Book on Malayan Agriculture – University of Malaya, 1967.

(3) Pahang Tenggara Study.[1] Study Paper No. 21, Potential for Fruit Production and Processing in Pahang Tenggara, 1971.

(4) South Thailand Regional Planning Study[72] – Sector Study 3. Fruit and Horticulture and Oil Palm. Hunting Technical Services et. al. 1974.

(5) Purseglove J.W Tropical Crops: Dicotyledons, Monocotyledons.[86 & 87]

The variety of fruits and the widely differing yield potentials for each of them makes the use of an overall average yield for the fruit areas somewhat arbitrary. However, on the basis of available information an average of 5.0 tons per acre has been chosen and thus the production of fruit for Trengganu Tengah has been calculated overall (Table 8.44). Production has been assumed to start in Year 3 of each project.

8.10.7 Citrus

More information is available on citrus yields than on some other fruits but a definite projection cannot be made until research work has indicated which types are best suited to conditions in Trengganu Tengah. Using figures from the same sources as those in Table 8.42, an average yield of 5 tons per acre has been taken as a conservative estimate of production on a well-managed citrus estate under Malaysian conditions.

8.10.8 Vegetables

The proposed vegetable project in Area 30 will be planted with various vegetables which have widely differing yields per acre. As a guide to production, figures have been taken from the Johor Tenggara Report (Table 8.43) to indicate likely overall yield levels.

Table 8.43 Yields of Selected Vegetable Crops in Johor

Crops	Yield (ton/acre)
Long beans	5.3
Short beans	4.8 – 7.0
Cucumber	4.8 – 9.5
Hairy Squash	9.5 – 11.9
Chillies (red)	1.8
Chillies (green)	2.7 – 3.6

Source: Johor Tenggara Study,[6] Working Paper, Fruits and Vegetables, 1971.

Using the data in Table 8.43 as a guide, a figure of 6.0 tons/acre has been assumed in projecting yield of vegetables from the Trengganu Tengah project (Table 8.44).

8.10.9 Annual Crops

The 1,000 acre project (120) is to be planted with annual crops such as maize, sorghum, groundnuts and soya beans. It will, to some extent, serve as a private research and seed production centre, so yield projections are hard to make. However, a yield of 1 ton per acre of the crops mentioned should represent an average output and this figure is used in projecting the production up to 1990 (Table 8.44).

8.10.10 Sago

Only one sago project is proposed in Trengganu Tengah. A conservative estimate of potential yield given in the Pahang Tenggara Study[1] is 10 ton/acre (starch at 12 percent moisture) reached in the tenth year from planting. Harvesting is started in the eighth year. Using these figures as a basis, production for the project has been projected to 1990 (Table 8.44).

8.10.11 Grass Project

Information on the output of the Grass Protein Project (5) is based on the Working Paper prepared by the LKTT.[75] In this paper output of leaf protein concentrate in 1975 is given as 1,513 tons and 12,500 tons of grass pellets. In

1976 and succeeding years output of LPC is estimated at 3,125 tons and of grass pellets 25,000 tons. However, this project cannot be developed in two phases as proposed because of forestry constraints. Therefore it is not likely that peak production will be reached before 1980.

Table 8.44 Trengganu Tengah: Estimated Output of Minor Crops, 1975 – 1990

	tons				
Year	Fruit	Citrus	Vegetables (Area 30)	Sago Flour (Area 34)	Field crops
1975	–	–	–	–	150
1976	–	–	–	–	450
1977 – 80	–	–	–	–	1,000
1981	–	–	450	–	1,000
1982	–	–	900	600	1,000
1983	675	–	1,350	1,400	1,000
1984	1,914	–	1,800	2,400	1,000
1985	3,177	450	2,250	3,400	1,000
1986	4,527	1,575	2,700	3,800	1,000
1987	5,877	2,250	3,150	4,000	1,000
1988	7,695	2,940	3,600	4,000	1,000
1989	8,820	2,940	4,050	4,000	1,000
1990	10,104	2,940	4,500	4,000	1,000

8.11 Manpower Requirements

8.11.1 Introduction

The agricultural sector is at present the biggest employer in Trengganu Tengah and this trend will be continued throughout the development period. In fact the majority of job opportunities created by the proposed development programme will be in this sector either on the estates, settlement schemes or in agricultural processing facilities. The latter are dealt with in Chapter 10.

In this chapter the manpower requirements are detailed. In Chapter 11 consideration is given to the question of training needs.

8.11.2 The Level of Skills

In the analysis of the employment created by the agricultural development programme, the Consultants have graded the employment opportunities according to the levels of training and experience required. Five categories of job have been used and are defined below.

(i) **Managerial** – Managers and Assistant Managers for estates and settlement schemes. These men will certainly have considerable experience in their field and many of them will be either graduates or diploma holders from university schools of Agriculture or Agricultural Colleges.

(ii) **Supervisory/Clerical** – This category includes all estate and schemes clerical staff and mid-level supervisory staff. The latter would be classified as Conductors or Field Assistant on estates and Supervisors, Field Assistants and Settlers' Development Assistants on settlement schemes. Clerical staff will have at least some secondary education and this is preferable for field staff also. In the long-term it is not improbable that some field staff can, with assistance from their employer, enter the managerial category. This will depend on their aptitude and experience.

(iii) **Unskilled** – This category includes all regular and casual labour employed on estates and such people as drivers, watchmen etc. on settlement schemes. Educational attainment is not critical in this category, but it will certainly influence the progress of a labourer to foreman (mandor) grade.

(iv) **Contract** – At present much of the work of clearing, planting and early maintenance on agricultural projects is done by contractors. They have their own work forces who live in temporary housing on the job and move away as the permanent labour force or the settlers come in. As development proceeds and contract work decreases it is anticipated that some contract workers will settle on the new estates or settlement schemes as regular employees. It is likely that this category of worker will include migrants from other states.

(v) **Settlers** – This category consists mainly of the smallholders on FELDA schemes but also includes the youths from the FELCRA scheme.

8.11.3 The Numbers Employed

In 1973 there were about 6,500 people employed on large scale agricultural projects in Trengganu Tengah. Of these, about 2,500 were employed as contract workers. Under the proposed agricultural development programme the number of jobs will increase to nearly 18,000 by 1990 and these will nearly all be on a permanent basis (Tables 8.45 and 8.46).

Table 8.45 Projected Employment in the Agricultural Sector, 1973 – 1990

Grade	1973	1975	1980	1985	1990
Managerial	32	60	101	113	115
Clerical/Supervisory	145	236	449	559	604
Unskilled	2,497	2,734	6,462	9,563	11,680
Contract	2,536	4,812	1,952	1,652	89
Settlers	1,239	1,460	3,936	4,464	5,415
TOTAL	6,449	9,302	12,900	16,351	17,903

Using the standards established in Section 8.3, projections of employment by five year periods from 1973 to 1990 have been made for each project (Table 8.46). In all cases the processing element has been excluded and this is dealt with in Chapter 10. During the early years of most projects it is assumed that the development work and some maintenance will be done on contract. There will be some managerial and mid-level supervision of the work but few directly employed unskilled workers. The latter will be recruited as the project comes near to production by which time most of the contract workers will have been phased out. This trend is reflected in the process of the whole programme in which contract workers are in peak demand during the late 1970's and have almost disappeared from the scene in 1990. As previously mentioned many of them may be absorbed into the permanent labour force of the projects they helped to develop.

Table 8.46 Employment in the Agricultural Sector, 1973 – 1990

Area No.	Type	Crop	1973 Man[3]	1973 C/S[4]	1973 Uns[5]	1973 Con[6]	1973 Set[7]	1973 Total	1975 Man	1975 C/S	1975 Uns	1975 Con	1975 Set	1975 Total	1980 Man	1980 C/S	1980 Uns	1980 Con	1980 Set	1980 Total	1985 Man	1985 C/S	1985 Uns	1985 Con	1985 Set	1985 Total	1990 Man	1990 C/S	1990 Uns	1990 Con	1990 Set	1990 Total
101	S.S.[1]	Oil palm	2	20	77	–	505	604	2	20	102	–	505	629	2	20	71	–	505	598	2	20	80	–	505	607	2	20	80	–	505	607
106	S.S.	Oil palm	3	20	129	–	560	712	3	20	150	–	560	733	3	20	137	–	560	720	3	20	143	–	560	726	3	20	143	–	560	726
105	S.S.	Oil palm	1	6	1	176	–	184	1	8	4	250	–	263	2	16	5	–	278	301	2	16	5	–	278	301	2	16	5	–	278	301
114	S.S.	Rubber	1	8	4	–	174	187	1	8	4	–	174	187	1	8	4	–	174	187	1	8	4	–	174	187	1	8	4	–	174	187
122, 121	S.S.	Oil palm	1	8	1	582	–	592	3	20	5	596	221	845	3	31	7	–	691	732	3	31	7	–	691	732	3	31	7	–	691	732
107	Est.	Rubber	2	10	25	1,563	–	1,600	5	15	75	1,272	–	1,367	9	40	1,206	131	–	1,386	9	40	2,797	–	–	2,846	9	40	2,797	–	–	2,846
103	FES[2]	Research	1	10	60	–	–	71	2	16	70	50	–	138	3	20	75	–	–	98	3	20	75	–	–	98	3	20	75	–	–	98
102, 104	Est.	Cocoa	2	10	120	–	–	132	2	10	120	–	–	132	2	10	134	–	–	146	2	10	134	–	–	146	2	10	134	–	–	146
112, 115) 116, 117)	Est.	Oil palm	14	40	1,633	42	–	1,729	14	40	1,640	–	–	1,694	14	40	1,464	–	–	1,518	14	40	1,651	–	–	1,705	14	40	1,651	–	–	1,705
118	Est.	Oil palm	3	6	201	–	–	210	3	6	208	–	–	217	3	6	176	–	–	185	3	6	200	–	–	209	3	6	200	–	–	209
123	Est.	Oil palm/ Rubber	2	7	246	173	–	428	3	7	298	170	–	478	3	9	435	–	–	447	3	9	440	–	–	452	3	9	440	–	–	452
6,109) 110)	S.S.	Oil palm	–	–	–	–	–	–	3	29	5	995	–	1,032	5	70	15	196	1,428	1,714	5	71	15	–	1,642	1,733	5	71	15	–	1,642	1,733
111	Est.	Oil palm	–	–	–	–	–	–	5	10	–	771	–	786	9	31	1,092	70	–	1,202	9	31	1,078	–	–	1,118	9	31	1,078	–	–	1,118
113	S.S.	Oil palm	–	–	–	–	–	–	1	4	1	87	–	93	2	14	5	112	300	433	2	14	5	–	400	421	2	14	5	–	400	421
119	Est.	Oil palm	–	–	–	–	–	–	2	4	–	203	–	209	3	10	264	272	–	549	3	15	447	–	–	465	3	15	447	–	–	465
120	Est.	Annual Crops	–	–	–	–	–	–	1	4	30	40	–	75	1	8	50	–	–	59	1	8	50	–	–	59	1	8	50	–	–	59
13	Est.	Oil palm	–	–	–	–	–	–	–	–	–	–	–	–	3	8	43	324	–	378	3	8	293	–	–	304	3	8	293	–	–	304
16	Est.	Oil palm	–	–	–	–	–	–	2	2	–	87	–	91	3	8	278	26	–	315	3	8	293	–	–	304	3	8	293	–	–	304
17	Est.	Oil palm	–	–	–	–	–	–	–	–	–	–	–	–	3	8	143	112	–	266	3	8	293	–	–	304	3	8	293	–	–	304
19	Est.	Oil palm	–	–	–	–	–	–	2	2	–	87	–	91	3	8	278	26	–	315	3	8	293	–	–	304	3	8	293	–	–	304
23	Est.	Oil palm	–	–	–	–	–	–	–	–	–	–	–	–	3	8	143	112	–	266	3	8	293	–	–	304	3	8	293	–	–	304
24	Est.	Oil palm	–	–	–	–	–	–	–	–	–	–	–	–	3	8	43	324	–	378	3	8	293	–	–	304	3	8	293	–	–	304
25	Est.	Oil palm	–	–	–	–	–	–	2	2	–	87	–	91	3	8	278	26	–	315	3	8	293	–	–	304	3	8	293	–	–	304
5	Est.	Grass protein	–	–	–	–	–	–	2	8	20	100	–	130	4	14	28	–	–	46	4	14	28	–	–	46	4	14	28	–	–	46
34	Est.	Sago palm	–	–	–	–	–	–	1	1	2	17	–	21	1	1	8	–	–	10	1	2	20	–	–	23	1	2	20	–	–	23
26	FES	Research	–	–	–	–	–	–	–	–	–	–	–	–	3	12	80	–	–	95	3	18	100	–	–	121	3	20	100	–	–	123
1	Est.	Coconuts	–	–	–	–	–	–	–	–	–	–	–	–	1	2	–	33	–	36	1	2	41	–	–	44	1	2	41	–	–	44
2	Est.	Fruits	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	3	45	–	–	48	1	3	45	–	–	49
3	Est.	Fruits	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	26	–	65	91	–	2	26	–	–	28
4	S.S.	Coconuts	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	54	–	–	54	–	3	54	–	–	57
7	Est.	Cattle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	–	39	41	–	2	24	–	–	26	–	2	24	–	–	26
8,9,10	S.S.	Oil palm	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	2	16	–	1,165	1,181	1	2	16	–	1,165	1,183
12	Est.	Coconut/cocoa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4	37	264	–	–	305	4	37	264	–	–	305
14	Est.	Fruits	–	–	–	–	–	–	–	–	–	–	–	–	1	3	–	43	–	47	1	3	90	–	–	96	1	3	90	–	–	96
15	Est.	Oil palm	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	8	–	10	1	4	116	–	–	121	1	4	116	–	–	121
18	Est.	Citrus	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	62	–	–	64	–	2	62	–	–	64
20	Est.	Rubber	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2	178	–	–	180	–	2	178	–	–	180
21	Est.	Rubber	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	28	–	30	1	4	716	–	–	721	1	4	716	–	–	721
22	Est.	Rubber	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	28	–	30	1	5	341	–	–	347	1	5	341	–	–	347
29	Est.	Coconuts	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	28	–	30	3	18	87	–	–	108	3	18	87	–	–	108
30	Est.	Vegetables/ Fruits	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	26	–	28	1	7	343	–	–	351	1	7	333	–	–	341
31	Est.	Cocoa	–	–	–	–	–	–	–	–	–	–	–	–	1	1	–	3	–	10	1	3	55	–	–	59	1	4	82	–	–	87
119	Est.	Cocoa	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	–	–	1	10	82	–	–	93	1	10	82	–	–	93
																					1	3	343	–	–	347	1	3	343	–	–	347
																					2	25	248	68	–	343	2	25	248	68	–	343
																					1	3	51	–	–	55	1	3	51	–	–	55
																					1	3	78	–	–	82	1	3	78	–	–	82
TOTAL			32	145	2,497	2,536	1,239	6,449	60	236	2,734	4,812	1,460	9,302	101	449	6,462	1,952	3,936	12,900	113	559	9,563	1,652	4,464	16,351	115	604	11,680	89	5,415	17,903

(1) S.S. – Settlement Scheme
(2) FES – Field Experiment Station
(3) Man – Managerial
(4) C/S – Clerical/Supervisory
(5) Uns – Unskilled
(6) Con – Contract
(7) Set – Settlers

8.12 Implementation of the Agricultural Development Programme

8.12.1 The Role of LKTT in Agriculture

The leading role in the development of Trengganu Tengah will be played by the Development Authority. This holds true in the agricultural sector as in all sectors. The promotion, planning and coordination of the agricultural development programme is the ultimate responsibility of LKTT although other agencies and government departments will be required to play appropriate parts.

The coordination of research programmes, siting of projects and promotion of the diversification policy will require an understanding of the technical factors involved and for this reason it would seem very relevant for the Authority to employ an experienced agriculturalist to look after agricultural matters. Planning and directing the agricultural diversification programme would be a major function of such a man. In addition, he could advise on and evaluate the various proposals put up by investors, monitor the progress of ongoing projects and act as a liaison between LKTT and the public and private technical bodies concerned with agriculture in Malaysia. A man with both research and commercial experience in Malaysia would be most suitable for the job. Such an appointment could be for a limited period only, say five years, and in no way would it conflict with the present relationship of LKTT, the Department of Agriculture, MARDI and other agencies.

Whether or not the LKTT appoints an agriculturalist, it will be desirable to have a technical committee on agriculture and it is suggested that this should consist of the following: the General Manager of LKTT, the agriculturalist (if appointed), the LKTT agricultural economist, a representative of MARDI and the State Director of Agriculture. Other members could be co-opted when specialised subjects (such as livestock production) are under discussion. The rate at which trial results by MARDI are translated into commercial projects on the ground will depend very much on the degree of liaison between MARDI and the LKTT and the committee suggested above should ensure the best possible contact. The policy of inviting investors to put forward their proposals without taking into account the limitations of the development area should not be followed. Instead applications to participate in specific pilot projects and development projects should be invited from suitably qualified investors. Some criteria for selecting such investors should be:

(i) Proven technical and managerial ability in the field of their project.

(ii) Sound financial backing.

(iii) Malay participation.

Two new concepts have been recommended for the development area; centralised processing of oil palm and central settlements for estate employees and smallholders. If these proposals are to be adopted, the LKTT should immediately start to promote them and inform developers in the agricultural sector that implementation of these proposals is a pre-condition to participation in Trengganu Tengah. Only by making this quite clear initially, will the natural unwillingness of a traditionally conservative industry to accept new policies be overcome.

8.12.2 Role of Other Agencies

The State Department of Agriculture is already active in promoting and implementing diversified cropping programmes in Trengganu. It also has two field stations which are engaged in propagating and distributing improved planting material of fruit trees and vegetables. It is assumed that the Department will continue this work to assist the farmers in alienated smallholdings in Trengganu Tengah and to extend the service to newcomers who are allocated land for production of fruit and vegetables for local consumption as outlined earlier. Whether or not the LKTT appoints an agriculturalist the longer term knowledge and experience of the Department will continue to be of great value to the Authority when technical matters arise.

The FOA (Farmers' Organisation Authority) is already in contact with smallholder farmers in the development area. It is hoped that the Authority will encourage the introduction of new crops (especially fruit and vegetables) to smallholders who will help to supply the newly created markets in the settlement areas. The FOA provides credit, seeds, fertilisers, advisory and marketing services to smallholder farmers through the Farmers' Development Centre (FDC's). There are already eleven such centres in Trengganu State, including those at Kuala Brang, Dungun and Kemaman. Whilst none of these three are located within the study area, their sphere of influence extends there and in time they will be able to offer their services to the farmers living up the inland river valleys. At present the criterion for a FDC is the existence of some 3,000 – 5,000 farming families, but in the future this is likely to be reduced, ultimately to 600 – 1,000 families. This will enable new FDC's to be set up within the study area, and there are already plans for new FDC's to be built in Jerangau and Kijal. The first will be located within Trengganu Tengah and both will serve farmers in the area. It is recommended that these centres are built and every effort be made to ensure that all small-scale farmers can be members of a FDC if they so wish. It is considered that this is the best way to ensure that development of the region does not pass them by.

The part to be played by MARDI in agricultural research has already been fully stated. The MARDI should prepare a programme of agricultural research along the lines suggested in this study. This should be discussed fully with the LKTT and other agencies involved. The FES Jerangau should be fully utilised to accommodate the programme and suitable research staff appointed to the station to put it into effect.

The other agencies concerned with agriculture are mostly concerned with implementing specific projects and include FELDA, FELCRA, RISDA and SEDC. The RISDA will also continue its primary functions of supervising and financing the replanting the smallholder rubber in the area and setting up small processing facilities. If a SMR factory is built in Community E, this could offer processing facilities to existing smallholder growers as well as to the proposed new estates. In this connection the participation of MRDC could be useful.

The Trengganu SEDC is understood to be curtailing its investment in direct agriculture and concentrating more on industrial development. This agency could well play an important role in the setting up of processing facilities for oil palm, rubber, coconut and fruits either alone or in conjunction with other public and private sector entrepreneurs.

Given the wide range of agencies already established the LKTT should ensure that the appropriate body is involved when suitable projects are proposed.

CHAPTER 9

Proposed Forest Development

9. PROPOSED FOREST DEVELOPMENT

9.1 Introduction

9.1.1 Policy Guidelines

The forests of Malaysia represent one of the few remaining extensive sources of quality tropical hardwoods in the world. This resource is rapidly attaining a strategic position by virtue of its importance as a long-term supply source of tropical wood-based products for the world markets. Detailed studies indicate that the forest sector has the potential to make a substantially increased contribution to national growth and that the forests could have significant investment potential as a long-term renewable resource base. These studies also indicate that there is an increasing trend within the industry itself towards greater production efficiency and product diversification.

The forest resources of Trengganu Tengah have already been described in this report (Section 4.5). In 1974, the area estimated to be under forest of all kinds was 847,770 acres (Table 4.8). Of this, more than 600,000 acres is classified as Permanent Forest with varying potentials for productive, protective or amenity use.

Large areas, previously designated as Forest Reserve, have been released for agricultural development during the development period (1970 – 1990) and, since 1970, exploitation has proceeded at a rapid rate in these areas.

The Terms of Reference for this study require that the Consultants make proposals for the development of the forest resources so that the maximum economic benefit can be obtained while satisfying the socio-economic aims of the NEP. In addition we have been asked to suggest ways in which the timber resources may be exploited as fully as possible without creating constraints to the rate of land clearance for agricultural development. Finally, the Consultants have to take into account the national policy on conservation, both to preserve the natural protective cover of the soil and also to ensure that the programmes for timber extraction do not conflict in the long term with the need for environmental stability.

9.1.2 Forest Reserves

Of great significance for the long-term development of forestry was the recent decision of the National Forestry Council to establish permanent and productive forest reserves throughout the country. These reserves are of the utmost importance to assure the success of silvicultural and enrichment planting programmes. The immediate future appears to present a unique opportunity to restructure the wood-based industrial sector in line with current thinking on coordinated planning, production efficiency and quality control, more effective marketing and better business management.

The latest policy document [116] under consideration by the National Forestry Council sets out the general objectives for the establishment of a Permanent Forest Estate and Section One reads as follows:–

"To dedicate as Permanent Forest Estate sufficient areas of land strategically located throughout the country in accordance with the concept of rational land-use, in order to ensure:

(a) The sound climatic and physical condition of the country, the safe-guarding of water supplies and soil fertility and the prevention of damage by flooding and erosion to rivers and padi and other agricultural land, the mitigation of the effects of environmental pollution due to industrial activities; such forest lands being known as Protective Forests.

(b) "The supply, in perpetuity at reasonable rates, of all forms of forest produce which can be economically produced within the country and are required for agricultural domestic and industrial purposes and for export; such forest lands being known as Productive Forests.

(c) "The conservation of adequate sites for the protection of the country's unique flora and fauna, for recreation, for education and for research; such forest lands being known as Amenity Forests."

Responsibility for putting such plans into effect rests with the State Forestry Department. The Department controls the utilization of all reserve areas and is responsible for siting boundaries, issuing licences and permits where the exploitation is to be allowed, collecting revenue and seeing that the timber removed corresponds to the allowable types and correct size. On the land designated for agricultural development the Forest Department has to issue clearance indicating that all useful timber has been removed before the developer can enter his area. Forest Reserves then, are units for control purposes and all the forest areas in Trengganu Tengah should be so designated with a safe-guard to ensure security of tenure for the Forest Department.

With the opening up of several former Forest Reserve areas in Trengganu Tengah for development, it has become necessary to redraw the boundaries of some of the existing reserves and in some cases create new ones. The State Forest Department, Trengganu is preparing maps prior to re-demarcation of many Forest Reserves and proposals for further reservation throughout the State. Close contact has been maintained with this work and both the Department and the Consultants' proposals are based on the boundaries of Soil Suitability Classes 4 and 5. (Appendix D). Our proposals differ only in designating land with impeded drainage as having agricultural rather than forestry potential. Some of these boundaries (especially those in Class 4) require further demarcation but most of them are self evident on the basis of topography alone (Class 5 STP).

The Consultants propose a total area of 631,760 acres for reservation as Permanent Forest (Table 9.1 and Fig. 9.1). The estimated total length of the boundaries is 650 miles and it is to be surveyed and marked under contract. Since many of the boundaries will be shared with the agricultural development areas, there will be considerable savings in time and expense if all agencies concerned with development in the area cooperate closely in the mapping and surveying.

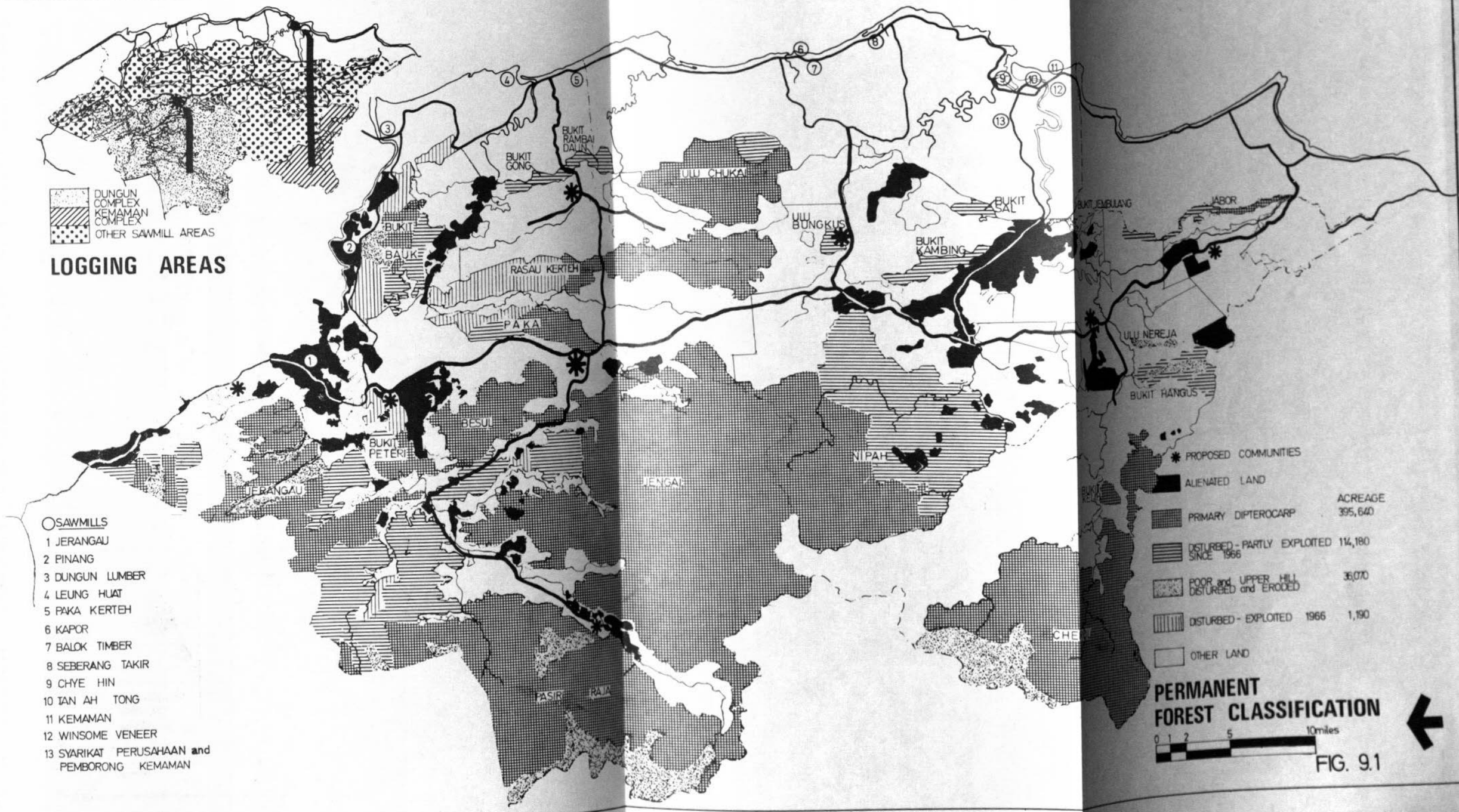

DUNGUN COMPLEX
KEMAMAN COMPLEX
OTHER SAWMILL AREAS
LOGGING AREAS
BUKIT RAMBAI DAUN
BUKIT GONG
ULU CHUKAI
BUKIT BAUK
RASAU KERTEH
PAKA
ULU BUNGKUS
BUKIT SAL
BUKIT KAMBING
BUKIT JEMBUANG
JABOR
ULU NEREJA
BUKIT HANGUS
BESUL
BUKIT PETERI
JERANGAU
JENGAI
NIPAH
PASIR RAJA
SAWMILLS
1 JERANGAU
2 PINANG
3 DUNGUN LUMBER
4 LEUNG HUAT
5 PAKA KERTEH
6 KAPOR
7 BALOK TIMBER
8 SEBERANG TAKIR
9 CHYE HIN
10 TAN AH TONG
11 KEMAMAN
12 WINSOME VENEER
13 SYARIKAT PERUSAHAAN and PEMBORONG KEMAMAN
PROPOSED COMMUNITIES
ALIENATED LAND
ACREAGE
PRIMARY DIPTEROCARP 395,640
DISTURBED - PARTLY EXPLOITED SINCE 1966 114,180
POOR and UPPER HILL DISTURBED and ERODED 36,070
DISTURBED - EXPLOITED 1966 1,190
OTHER LAND
PERMANENT FOREST CLASSIFICATION
0 1 2 5 10miles

FIG. 9.1

Table 9.1 Proposals for Permanent Forest Reserves in Trengganu Tengah

Name [2]	Classification [1]					Total	
	(D)	D	U	P	D/E	PD	(acres)
JERANGAU	10,400					29,060	39,460
Pasir Raja	27,520	1,190	16,780	5,200		62,960	113,650
JENGAI	7,180					130,080	137,260
Bukit Peteri	1,520					5,820	7,340
BUKIT BAUK						16,600	16,600
BESUL	4,350					15,390	19,740
Paka	9,210						9,210
RASAU KERTEH	2,890					23,010	25,900
Bukit Gong	2,270						2,270
Bukit Rambai Daun	1,830						1,830 [3]
Ulu Chukai	5,070					13,000	18,070
Ulu Bungkus	1,210						1,210
NIPAH	28,260					44,090	72,350
Bukit Kambing	2,990						2,990
Bukit Sal	1,010						1,010
Bukit Jembulang	510						510 [4]
CHERUL	2,050				14,090	77,410	93,550 [6]
Bukit Kelilih [5]						1,810	1,810
Ulu Neraja	1,260						1,260
Bukit Hangus	5,030						5,030
JABOR	1,670					860	2,530
Sub-total	116,230	1,190	16,780	5,200	14,090	420,090	573,580
Chenderong	27,920					30,260	58,180 [7]
TOTAL	144,150	1,190		36,070		450,350	631,760

Notes: (1) Classification: Broad Forest Types

(D) = Disturbed – Exploited since 1966
D = Disturbed – Exploited 1966
U = Upper Hill
P = Poor
D/E = Disturbed/Erosion
PD = Primary Dipterocarp

See also Table 4.1 and for description and evaluation see "A National Forest Inventory" FAO 1973. (111)

(2) Existing Forest Reserve Names in CAPITALS.

(3) Amenity Reserve.

(4) 1490 ac. of which 510 are inside Trengganu Tengah area.

(5) At present part of CHERUL Forest Reserve.

(6) Includes Agricultural Dev. Areas 32 (21,500 acres) and 33 (5,000 acres) for release in year 2000+.

(7) 61777 ac. less Area No. 119(3,597 acres).

9.1.3 The Need for Conservation

The role of the natural vegetative cover in maintaining environmental equilibrium is now recognised world wide, but in many cases this recognition is almost too late. Several countries in S.E. Asia provide examples of how indiscriminate removal of the forest cover has resulted in irreversible environmental changes with, in some cases, catastrophic consequences. Happily, Malaysia does not provide such examples, due partly to the climatic and demographic nature of the country and also to a considerable previous record of conservation policy. However, any land development programme which involves large scale clearing of forest or large scale exploitation of permanent forest, must give due consideration to the preservation of the environment and in particular the minimising of soil erosion, rainfall run off and flooding.

The proposals for the establishment of a National Forest Estate being studied lay emphasis on the need for conservation, for both economic and social reasons. In the latter case, the value of forest for amenity purpose is recognised.

Historically the concept of "Protective Reserves" (now perhaps to be called "Protective Forests") arose from the action of the Forest Department to obtain a proper concept of good land usage. Initially, Protective Reserves were defined as forests over the 1,000 foot contour. The next concept was that of "limiting slope." The Johor Tenggara Study[16] restricts agricultural development to land below 20° slope. Land with slopes over 20° would be Productive forests below the 500 foot contour and Protective forest above it. The hill forest, it was recommended, "may become productive should techniques improve but forest on slopes greater than 25° must remain as permanent protective forest." Other authorities consider the distinction a matter of logging capability and put the limit at 30° slope for ground skidding. FAO,[116] classified edaphic and upper hill forest as unlikely to be harvested and to be mainly protective forests in the major water sheds – "Because of adverse terrain condition it is not economically possible to harvest all areas which are classified as productive functions which should not be jeopardised, and it is a function of proper development strategy to recommend methods of research and interim measures to ensure that their protective function remains or, where damaged, is restored. High lead skidding, in itself unlikely to be economic (prospective yields of 20 tons and over per acre are illusory at present), should not be allowed and the demarcation and record of protective forest areas should be subsequent to ground surveys by competent logging engineers. The question of demarcation must be given more thought for the foundation of good land usage depends very largely upon it.

The need for conservation of natural vegetative cover in Trengganu is very obvious in the light of past experience. The State is within the highest rainfall area in the country and with precipitation concentrated during the monsoon months the dangers of soil erosion, rapid run off and flooding are already considerable. The major rivers in Trengganu Tengah, the Sungei Dungun and the S. Kemaman and some of the minor rivers have a long history of flooding, both upstream within the study area itself and near their outflows to the sea. These annual floods are already costly in terms of loss of life and property. Any clearance of land in the area can only intensify the problem. National policy is already clear on this point and it is up to the agencies responsible for development in the area to ensure that the policy is implemented. This duty is primarily shared between the State Department of Forestry and the LKTT.

9.2 Exploitation of Forest Resources

9.2.1 General Proposals

Exploitation of the forest resources of Trengganu Tengah is already well advanced. Since 1970, large areas designated for agricultural development have been allocated licences and permits and at 1974 about 160,000 acres had been cleared of commercial timber. This land is largely already planted with agricultural crops or under development. Current licences and permits cover a further 120,000 acres which will be cleared of commercial timber by 1980. In this case the principal task facing the Consultants is to identify and minimise any constraints that this programme may impose on the agricultural development programme, while at the same time allowing maximum economic benefit to be derived from the forest resource. A programme has been prepared (Section 9.4) which, it is believed, will satisfy both these aims.

Some 600,000 acres of the study area will remain under Permanent Forest as reserves. Half of this has already been allocated (Table 9.2) to two wood-based industrial complexes, one in the District of Dungun and the other, which is now starting operations, in the District of Kemaman. We have been advised to regard these two projects as fixed commitments and we have thus confined our comments on them to these aspects concerning their place in the overall development plan. Most of the remaining Permanent Forest area is to be allocated to the existing sawmills which are already drawing their raw materials from Trengganu Tengah. Some of the Permanent Forest, however, is to be left untouched as Protective Forest or Amenity Forest. In addition to these areas there is a Special Reserve, known as the Chenderong Concession, which has an area of 58,180 acres and it is not included in Trengganu Tengah for planning purposes.

Modern logging operations are not all labour intensive and by themselves do not contribute much to social development. It is in the processing and further manufacture of wood products that there is more scope for intensive employment. However, even in these industries, employment is nothing like so great as in agriculture, if the area of forest involved is compared with an equal area under most tropical agricultural crops. The Forestry sector therefore, will not contribute much to the total manpower requirement for Trengganu Tengah. But, to gain the maximum employment benefit from the forest sector, the Consultants recommend that as much processing and further manufacture as possible should be carried out in Trengganu Tengah or at least in the State of Trengganu.

9.2.2 The Dungun Complex

Discussions have been going on for at least two years on the possibility of a fully integrated wood-based industrial complex to be sited in the Dungun district. Most recently the State Government has been negotiating with the Government of Romania along these lines but no firm decisions have been made yet except to confirm the principle of such a complex for planning purposes. Although the Romanians have produced at least one feasibility study of the project, the Consultants have been unable to obtain any of the documentary material relating to it. In these circumstances it is

Table 9.2 Projected Allocation of Permanent Forest

Reserve	Wood-based Industries Complex				Allocation for Sawmills		Amenity	Protective	Total
	Dungun		Kemaman						
	D&(D)[1]	PD[2]	D&(D)	PD	D&(D)	PD			
	acres								
JERANGAU	5,960	26,500			4,600	2,400			39,460
Pasir Raja	28,710	62,960						21,980	113,650
JENGAI	7,180	130,080							137,260
Bukit Peteri	1,520	5,820							7,340
BESUL	4,350	15,390							19,740
BUKIT BAUK						16,600			16,600
Paka					9,210				9,210
RASAU KERTEH					2,890	23,010			25,900
Bukit Gong					2,270				2,270
Bukit Rambai Daun							1,830		1,830
Bukit Sal					1,010				1,010
Ulu Chukai					5,070	13,000			18,070
Ulu Bungkus					1,210				1,210
Bukit Kambing					2,990				2,990
NIPAH					28,260	44,090			72,350
Bukit Jembulang					510				,510
CHERUL			2,050	79,220[3]				14,090	95,360
Ulu Neraja					1,260				1,260
Bukit Hangus					5,030				5,030
JABOR					1,670	860			2,530
TOTAL	47,720	240,750	2,050	79,220	65,980	99,960	1,830	36,070	573,580
	288,470		81,270		165,940				

(1) D&(D) = DISTURBED – EXPLOITED 1966 (1190 ac. only) and after 1966 (D).

(2) PD = PRIMARY DIPTEROCARP.

(3) Includes 26,500 acres suitable for agricultural development (Areas 32 and 33) which could be released from Year 2,000.+

not possible to describe the proposed complex except in general terms and to comment on those aspects which seem relevant to the technical, economic and social aspects of the Trengganu Tengah Study.

The Dungun Complex has been allocated a total area of 288,500 acres of Permanent Forest .more than 80 percent of which is classified as Primary Forest (Table 9.2). The Forest Reserves and proposed reserves involved are: JERANGAU, JENGAI, BESUL, Pasir Raja and Bukit Peteri. In addition, Agricultural Development Areas 8, 9, 10, 11 and 14 (Fig. 8.1) which total 24,443 acres should be included to augment the cash flow in the early years without jeopardising the main resources. Development of these areas for agriculture will in any case be delayed until after 1980 by which time the Complex road network and new public roads should provide access to them. In the case of Area 14, however, early development is recommended in the agricultural programme and it should receive Forestry Department clearance by 1978. Areas 8, 9 and 10 should be released from logging by 1980 to 1984 at which time agricultural development is scheduled to begin (Chapter 8).

The growing stock, the precise annual coupe and estimated yields can only be determined from detailed inventory (ideally supplemented by aerial photography on a scale of 1:10,000) and detailed topographical survey for road construction. The indications of what input to expect, based on the National Forest Inventory (reduced by an allowance of 13 percent for land that may be found too steep for exploitation on survey) suggest a possible build up to a steady 90,000 tons input (Table 9.3) subject to the caution that the figures per acre are based on only a few samples showing great variability. Choice of the harvesting period is crucial because on that decision rests not only the size of the industry the resources base can support, but also the future of the next harvesting period and so on. The figures (Table 6.6) suggest that the differences in yield for different diameter limits, within the realm of practicality, are not wide. Hence the main consideration is not yield per acre so much as the size of the annual coupe. The first harvesting period recommended by FAO[116] for Hill Dipterocarp forests is 40 years using a diameter limit of 18" for species group 1.

The Forest Department has chosen a harvesting period of 25 years based on a theoretical halving of a new rotation of 50 years (the previous rotation was 70 years) which fits in with the FAO strategy alternative quoted but with a minimum diameter of 24" for Dipterocarps. The available information on 25 year felling cycles is sparse and leads to the Consultants' view that adoption of the bicyclic system should be regarded as experimental and should be done in a manner which will avoid irrevocable commitment to the annual harvesting of 1/25th of the permanent forest area.

The suggestion is made here, and embodied in Table 9.3 that the normal procedure of industrial development from a low input to a higher during the pioneer stages should be used as an insurance against the possibility of a future need to lengthen the period. The present accepted bicyclic system will be used, but the size of the annual coupe will conform to a different period: 1/40th of the permanent forest (productive). Replicated experiments being carried out elsewhere in the State should, after 10 years, give some evidence on practicality of the system. A lower target for the annual coupe would also provide room for flexibility in conforming to market demand cycles, thus turning to advantage (without jeopardising the resource

Table 9.3 Dungun Complex Resource Base and Log Output Indications[1]

Forest Type	Area	Diameter limits	PER ACRE		TOTAL	
			Fully on market	Fully and partly on market	Fully on market	Fully and partly on market
	Acres	Inches	Tons/Acre		FD Tons	
Primary (Exploitable)	210,000	Dipterocarps 24"+ Non Dipterocarps 18"+	10.5	11.7	2,205,000	2,457,000
Disturbed	48,000	All species 18"+	(7.5)	(8.2)	(360,000)	(394,000)
Agriculture Development areas	24,443	Nil	11.6	13.0	283,000	318,000
Average Annual Log Availability First 5 Years from 1/40 of Primary Forest (5250 ac.)					55,100	61,400
Rising in Second Period of 5 years						
i) 1/40th of Primary Forest (5250 ac.)					55,100	61,400
ii) From Agricultural Areas (4894 ac.)					56,800	63,600
					111,900	125,000
Rising in Third Period of 5 Years (if results satisfactory) to 1/25th of Exploitable Primary Forest (8,400 ac.)					88,200	98,300

(1) Based on Table 6.6.

flow) the fluctuations typical of world timber markets. Also by retaining the disturbed forests without salvage fellings except in special circumstances, a further guarantee of a renewed resource based would be maintained. Emphasis must be laid above all on the need for collection and refinement of management data.

The location of the processing facilities for the Dungun Complex is still to be decided but it is our firm recommendation that it should be sited near the proposed Sub-Regional Centre (Community C). In choosing this complex as one of the nine major focal points for wood-based industrial growth in the country, the FAO [116] recommended that "The growth point should preferably be located some 15 to 20 miles west or southwest of the town (Dungun) as a coast location is not ideal from the view point of transportation economics unless the cost of developing infrastucture for such a centre is excessive." Siting at Community C would put seventy percent of the primary forest resource within a radius of 22 miles from the centre and would enable heavy vehicles to extract 80 percent of the log input without undergoing the restrictions of public road transportation. This proposal would also enhance the possibility of giving the Sub-Regional Centre an embryo industrial base in line with the Consultants' recommendations that this is needed if the new communities within Trengganu Tengah are to be viable (see Chapter 12).

9.2.3 The Kemaman Complex

The Kemaman wood-based Industrial Complex commenced operations during the study period and has been described in Chapter 6 as a "committed" project. It has been allocated a total area of 81,270 acres in the Cherul Forest Reserve (Table 9.2). Of this, 26,500 acres (Areas 32 and 33) have been identified as having potential for agricultural development (they contain soils in Suitability Classes 2 and 3). The harvesting system chosen for the complex is the " Bicyclic System" which would mean that these areas could be released for agriculture from the year 2,000. This would leave 55,000 acres productive area for the second harvesting period. We would not rule out the possibility of an earlier release of Areas 32 and 33 to agriculture but it would have to be justified on the grounds of regional land shortage or lack of employment opportunities in the agricultural sector. Neither of these factors is likely to apply within the foreseeable future.

The decision to site the complex processing centre in Kemaman was taken without reference to the Consultants. From the point of view of Trengganu Tengah, it was unfortunate but given the need to make an immediate start probably inevitable, since there is no location within the area which could at present supply the necessary infrastructure, services or manpower for such a project.

9.2.4 Allocation to Sawmills

The decision has been made to allocate all the remaining area of Productive Forest to existing sawmills after provision for the two major complexes. This is an endorsement of the FAO [105] proposals for the State: "The State Government would be wise to protect the industry which is already established, to grant reasonable security of resource supply, and to encourage expanded growth into advanced processing or secondary manufacture. No new primary manufacturing industries should be considered other than the two under negotiation (the Dungun and Kemaman Complexes) and every effort should be made to conserve the supply of logs." By 1978, it is forecast that there will be a shortage of logs (Table 9.4 and Fig. 9.2) in the area and this should provide an incentive for the modernisation and rationalisation of the existing sawmilling industry.

Fourteen existing and two planned sawmills have been considered (Table 6.7). No provision is now made for Ong Kim Tek and Austasia sawmills as there is no commitment to allocate forest and applicats are unwilling to proceed further in these circumstances. One more sawmill (Eastern Sawmill) drawing supplies from Trengganu Tengah but located near Kuala Trengganu is now included because of long term agreements (Table 9.5). The total area allocated is 166,00 acres (Table 9.2). Of this, 66,000 acres have been partially exploited and 26,000 acres of the 100,000 acres of primary forest are under agreement, leaving 74,000 for log supplies until the next harvesting period. The allocation of 165,940 acres to sawmills would theoretically provide an annual coupe of 4,100 acres after a 40 year first harvesting period. This area at 11 tons per acre, would yield 43,000 tons rising to 48,000 or even 50,000 tons if lower quality logs as well as species at present only partly on the market could be included. Such a yield would be far from sufficient for present requirements (158,000 tons in 1973 – Table 9.4). Indeed the Primary Forest will last 18 years only if husbanded carefully. The yields from the agricultural development area clearance and from agreement areas will be sufficient to supply sawmill needs until 1978. After that the choice must be made of either buying log supplies from the other two allocations (Dungun and Kemaman Complexes) and elsewhere (Chenderong for instance) or very drastically cutting down the number of mills. Certainly to conserve resources no more agreements should be made or licences and permits issued from now on in the Permanent Forests except within the allocation programmes whose proposed beginnings are detailed in this chapter.

For the conservation of remaining supplies great care must be taken. Further permits for sawmill exploitation should not be needed, except within Agreement Areas where they will have to be given until 1978. The sawmills prospective annual coupe is so inadequate that elaborate plans for re-structuring the industry seem superfluous. Supplies are still enough for two basic sawmill units on single shift working, [112] and, in the long term, rationalisation along these lines seem justified.

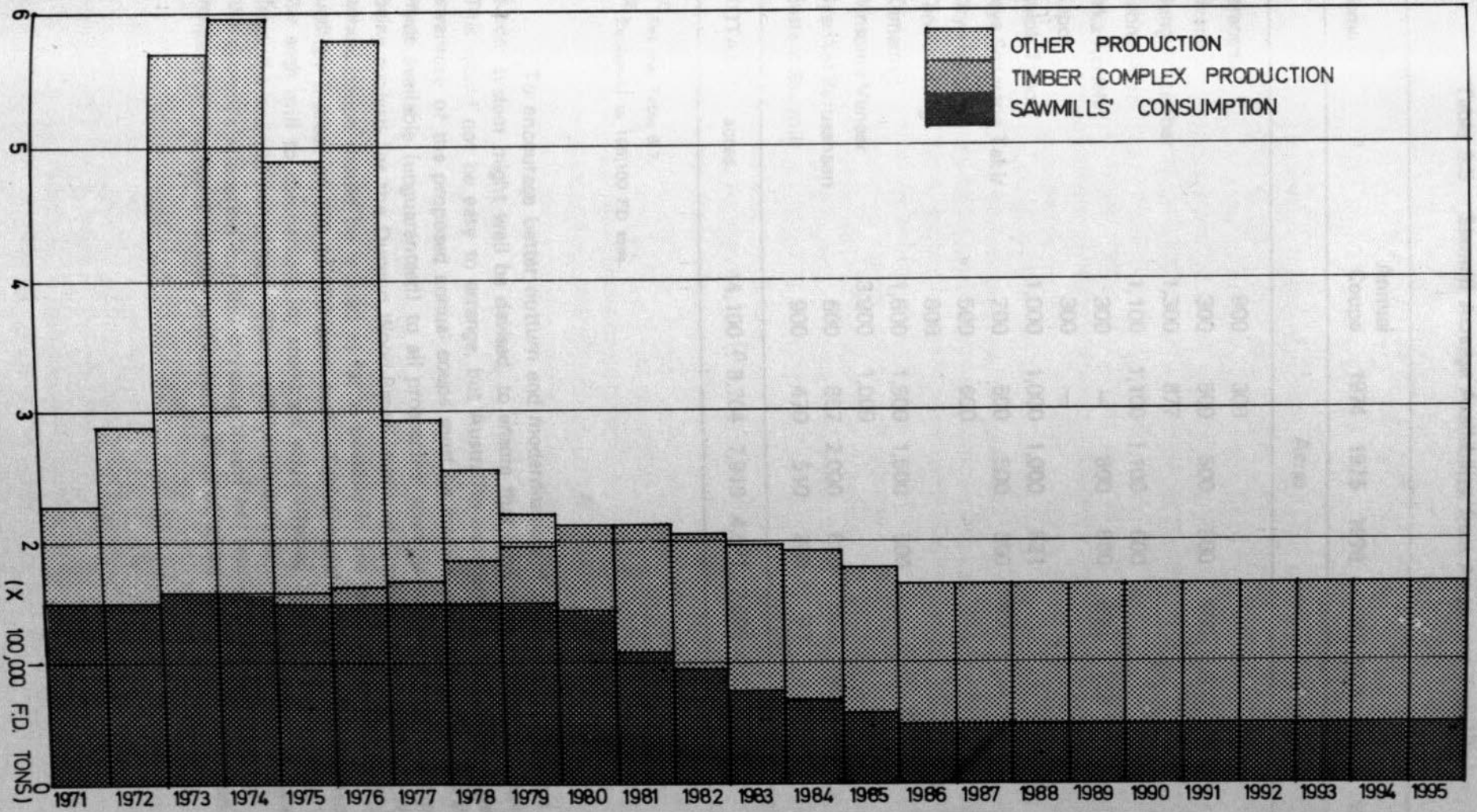
Table 9.4 Log Availability

Source	1971[2]	1972	1973	1974[3]	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	'000 FD tons[1]																			
Agricultural Development area clearance	140	200	320	397	381	398	162	68	17	12	33	47	50	52	43	16	–	–	–	–
Sawmills allocation – Permanent Forest	–	–	–	–	–	–	–	43	43	43	43	44	44	46	46	46	46	48	48	48
Kemaman Allocation – Permanent Forest	–	–	–	10	10	22	22	23	24	26	26	26	26	26	26	26	26	26	26	26
Dungun Allocation – Permanent Forest	–	–	–	–	–	–	10	20	40	55	55	55	55	55	55	70	90	90	90	90
Other	91	84	248	190	100	160	100	100	100	80	60	40	20	7	5	5	–	–	–	–
TOTAL	231	284	568	597	491	580	294	254	224	216	217	212	195	186	175	163	162	164	164	164
Processed																				
i) Kemaman					5	10	20	23	24	26	26	26	26	26	26	26	26	26	26	26
ii) Dungun					–	–	5	10	25	45	88	88	90	90	90	90	90	90	90	90
iii) Other Sawmills	150	150	158	155	150	150	150	151	150	145	103	98	79	70	59	47	46	48	48	48
iv) Log Exports	81	134	410	442	336	420	119	70	25	–	–	–	–	–	–	–	–	–	–	–
TOTAL	231	284	568	597	491	580	294	254	224	216	217	212	195	186	175	163	162	164	164	164

(1) FD ton equals 55 true cu. ft.

(2) Actual

(3) Estimated



LOG FLOW FORECASTS
FIG. 9.2

Table 9.5 Sawmill Acreage Availability from Agreement Areas[1]

Name	Annual Coupe	1974	1975	1976	1977	1978	1979	1980
				Acres				
Jerangau	900	300						
Pinang	300	500	500	500	500	500	500	74
Dungun Lumber	1,300	877						
Leong Huat	1,100	1,100	1,100	600				
Paka Kerteh	300	–	800	800	800	258		
Kapor	300	–						
Balok Timor	1,000	1,000	1,000	521				
Jaya Seberang Takir	700	500	500	500	500			
Chye Hin	500	600						
Tan Ah Hong	800							
Kemaman	1,500	1,500	1,500	500				
Winsome Veneer	3,900	1,000						
Syarikat Perusahaan	600	857	2,000	800	800	457		
Eastern Sawmill	900	470	510	330	90			
TOTAL acres.	14,100[2]	8,704	7,910	4,571	2,690	1,215	500	74

[1] See also Table 6.7.

[2] Equivalent to 155,100 FD tons.

To encourage better outturn and modernisation of the existing sawmills a tender system might well be devised, to ensure that progressive mills have an advantage. This would not be easy to arrange, but Australian experience could be useful. Detailed inventory of the proposed annual coupe must be made a year before hand and the figures made available (unguaranteed) to all prospective sawmills and the type of inventory[118] being evolved for the Dungun Wood-Based Industrial Complex seems suitable. The annual coupe should be located as far as possible in one locality and divided into perhaps 8 areas of 300 to 600 acres each. Tables would be produced giving handicaps for each mill to compensate for stumpage value affected by the distance of the coupe from the sawmill concerned. There will be pressure from outsiders to tender within the sawmill's allocation but this pressure should be resisted so as to ensure the renewal of the resource base and concentration of added value within the region.

9.2.5 Logging and Log Transport

The output of logs from Trengganu South (comprising most of the study area) has increased considerably in the last three years, from 231,000 tons in 1971 to 568,000 tons in 1973 and 361,000 tons in the first six months of 1974.

Hitherto, all the logging has been by small independant contractors. The allocation of licence areas in State land has been restricted, under current working plans, to areas required for agricultural development within five years, as far as could be foreseen. This was done in accordance with the policy of opening Forest Reserve on a rotational basis of 70 years, so as to obtain crop succession. The State land forests were thus to be regarded as reserves of future agricultural land to be held with timber on the land so as to justify building a good road system before release for agriculture. This principle was first introduced in the first working plan for the State of Pahang.

Felling is now completely by chainsaw. Crosscutting is done on site and, unfortunately, more often than not by scaling out standard log lengths from the butt instead of from the crown point and then dividing the commercial length into suitable logs without waste. Provision to penalise wasteful logging methods, high stumps, breakage, the leaving of marketable trees or log damage to remaining trees (including bark scoring) must be included in any agreement. The present compensation clause in the Standard Forest Department permit merely specifies "a sum not exceeding $100 for each breach of the permit." There is no clear provision for penalties for "avoidable waste" though causing "avoidable waste" is a breach of the permit. Similarly damage is not clearly defined nor is there any standard form for reporting waste and damage. Such a provision has been found most useful in Sarawak experience.[128]

Transport to the forest road is still largely by winch lorry but the skidder tractor combination is becoming common. No stem length hauling is done as it is in Sabah.

Forest access and internal roads are at present built by tractor (usually the same tractors as are used for skidding) to very low standards and none can be classed as all weather roads. Operators on a small scale are unlikely to appreciate that speedy transport and rapid turn round are essential to an economic extraction which is capable of fully justifying the capital expenditure on good roads.

Hauling on public roads is mostly by semi-trailer truck over an all-weather road system of low weight carrying capacity often narrow and poorly aligned. The load volume on public roads is limited by a system using log weights on an accepted rule of thumb basis.[117]

Permissible load in cwt x 2 equals cubic feet allowed. Thus for a maximum permissible laden weight of 360 cwt, the carrying capacity is 260 cwt (360 cwt gross weight less 100 cwt vehicle weight) and the allowable volume of timber is 520 cu. ft. (260 x 2).

Lorries (and by no means only timber lorries) are habitually overloaded. (52) Vehicular load limitations are based on axle loads but are subordinate to the maximum permissible road limit. A list of road classifications is published by the Road Transport Department and a maximum weight of 18 tons on specified roads is allowed for vehicles having more than six wheels or more than three axles. Spreading the weight over more axles could easily be encouraged by a reduction in tax for each additional axle and would be some compensation for the higher cost of vehicles of a type which, by this spreading of weight, could be calculated to do less damage to the pavement. Further research into hauling costs could well confirm reports of the spectacular reduction with increase in load. If the legal load for a two axle lorry could be increased from the present figure which works out at approximately 5 long tons, the hauling cost would probably be reduced by one third.

Malaysia could well compare its road regulations with those of other countries where forestry is a leading industry. In British Columbia (Canada), logs on the coastal highway are transported by five axle truck (2 axles in the rear trailer). The Gross Vehicular Weight, (GVW equivalent to the Malaysian MPLW – "Maximum Permissible Laden Weight") is 37½ tons. The weight of the vehicle and trailer is 10 tons and thus the load limit is 25½ tons. A six axle unit with a 3 axle trailer has a load limit of 31½ tons.

If the Dungun Complex builds roads to a higher weight carrying standard than the present public roads, much larger transportation units could be used, providing the access to the factory site does not involve the public road system.

The internal system and specification must aim, above all, at speedy extraction from the yarding point to the mill. This does not mean that excessive speeds which cause undue wear on machines as well as the road should be tolerated; but that the weight specification and engineering of the corners, gradients and passing places should allow for steady fast speeds (whether against the grade or on the flat) for 5 or 6 axle haulers, provided extraction does not include public roads. The economic model now available in Kuala Lumpur to calculate the optimum spacing of logging and spur roads should be used.

9.2.6 The Potential for Fibre Production

During the course of the study, the Consultants were asked to comment on the proposals for long fibre production from plantations of pine in Trengganu Tengah.

Both agricultural land and forests can be considered for fibre production. Future development strategy in the utilisation of industrial waste for short fibre production includes investigation on a national level[116] and long fibre production is already under development.

Work on the potential for pine planting in Malaysia has been going on for some years and the stage has been reached when commercial implementation is considered feasible. However, acreages of the kind suggested (100,000 acres) with adequate water supplies for such industrial development and access to ports are not likely to be found in Trengganu.[104] Another limitation is that steep land (class 5STP) must at present

be excluded from planting because of erosion hazards.[106] Proposed experimental sites are described west of the main range and they include 8 areas on steep land classed as "marginally suitable for conifers" (20° to 30° slopes) and "unsuitable" (over 30°) in the drier north (Kedah and Perlis). High rainfall east of the main range increases the erosion hazard so that parallel experiments are hardly justified in Trengganu until more information has been gained from those in the west.

Although land with soils in Class 4 might be suitable, there is insufficient land of this type in Trengganu Tengah to sustain the operation.

Thus in the present stage of knowledge an homogenous area large enough to support industrial development could not be found in Trengganu Tengah without including land planned, at the broad transect level, for agricultural development. There is a further difficulty to be surmounted before large scale planting is possible in Malaysia even on suitable land; this is shortage of seed. *Pinus caribaea var. hondurensis* does not fruit freely in Malaysia and, at present, phytosanitary regulations make importation difficult. This problem could be overcome in future.

There is scope for better utilisation of sawmill waste. The bulk of wood chips exported from Peninsular Malaysia is rubber wood. There are also some quantities of chips from mill residues and jungle wood. There thus exists a potential growth point for operations to supply the Japanese market. At present a degree of homogeneity in the raw material is demanded and industrial wood residues and sawmill waste must be centrally available in bulk to permit sorting on a large scale. Technology is advancing more rapidly than current literature suggests and soon there may be much less need for so much sorting. In the meantime, sawmill waste is unlikely to be used on a large scale. Similar difficulties about sorting exist in considering the utilisation for chips of small sized timber from land being cleared for agriculture, and the suggestion that small timber from logging operations in Permanent Forest would in addition be subject to strong silvicultural objections. Silvicultural problems are bad enough even for straight forward commercial logging in steep land forest let alone in logging selected species to 12" diameter or lower. This is not to say that properly replicated experiments are not justified. They are, as the rewards may be tempting.

9.3 The Phasing of Forestry and Agricultural Development

9.3.1 General Considerations

The Terms of Reference for this study lay emphasis on the need for the land clearance programme to coincide with forest exploitation so that fullest benefit can be gained from the extraction of commercial timber without imposing an unreasonable constraint on the pace of agricultural development.

The Consultants have examined this aspect in detail and in most cases have found that no serious constraints exist. The key to smooth implementation is close cooperation between the agencies concerned, notably the LKTT and the Forest Department. It is up to the Development Authority to make a clear statement of its

proposals for land clearance using mutually agreed maps and plans and giving due allowance for possible delays. Ideally the sequence of events in the land clearance programme should be as follows:—

Stage 1	—	Planning on the basis of Soil Suitability Map.
Stage 2	—	More detailed soil survey of areas selected for agriculture.
Stage 3	—	Allocation of land use between forestry and agriculture.
Stage 4	—	Demarcation and survey of proposed agricultural land.
Stage 5	—	Mapping and timber inventory
Stage 6	—	Provision of road access and internal road system.
Stage 7	—	Removal of commercial timber
Stage 8	—	Release of land by Forest Department.

Exploitation should begin at least two and a half years before release which should be timed for the middle of the year in the planting programme. The practice in Trengganu is to start felling in the third quarter of the year and burn the following March.

Although the phasing for land development proposed in this report reveals no critical constraints due to logging, it is acknowledged that a change in the programme or in other factors (such as the present slump in world timber markets) could give rise to delays in the release of land If this occurs some ways of speeding up logging operations and subsequent clearance by the Forest Department might be necessary. The following proposals could assist in this way.

(i) Instead of the present licence area size of about 1,000 acres, smaller areas could be given to more loggers; 500 acres would still be a big enough area to attract loggers if there was the prospect of further areas in the future. This proposal could only be applied to areas so far unlicensed but its effect should be to speed up the clearance of new areas.

(ii) A reasonable period of time should be allowed for logging in licensed areas after which the logger would be required to relinquish his area in favour of the land developer. The latter would pay for the standing timber remaining, as valued by the Forest Department and could then either extract the timber or fell and burn as circumstances dictated. Timber licences have a duration of one year and are usually renewed at the discretion of the Forest Department. If, at the end of the first year, the logger has shown little progress in his area, the Department could issue a warning to the effect that the licence would not be renewed at the end of the second year and the licensee would forfeit his right to the area. The land would then be released to the developer.

This proposal has a weakness in that prospective land developers for agriculture have a chance to benefit from logging. In some areas this situation has led to conflicts of interest in the past but legislation in Trengganu Tengah empowers the Development Authority to prevent this.

(iii) Where sawmill agreement areas are a constraint to land development, several sawmills in one area could be asked to work as a group on a given area to clear it more rapidly. They could then clear another area as a group and continue along these lines until their agreements expired. This would involve changing some current agreements and a proper period of notice should be given. In order to obtain the cooperation of the sawmill companies, a guarantee should be given that the duration and area of existing agreements would be honoured.

(iv) In the last resort, a case can be made in certain circumstances for felling and burning unexploited forest. The effect of a depressed log market on the rate of felling and thus on the pace of agricultural development is discussed in Chapter 15 (Section 15.3.2). The conclusion is that when log prices are sufficiently low to reduce the speed of extraction a decision has to be made by the LKTT as to whether logs should be burned or whether the pace of agricultural development should be slowed down. In economic terms the decision rests on the probability of the price of logs recovering by a given amount in future years. The rise in log margins in future years necessary to justify delaying oil palm development is set out in Table 15.20 given the assumptions regarding prices and yields mentioned in the text.

If existing log prices depress net margins to zero and there is a low probability of an early recovery in log prices then there is a strong economic case for burning the timber and clearing for agriculture. The alternative of diverting national resources to felling and stock-pilling timber by the public sector does not alter the basic decision regarding future price levels but might speed agricultural development.

9.3.2 The Phased Programme for Trengganu Tengah

Using these guidelines a programme of exploitation and release has been prepared. This has been fully discussed with both LKTT and the State Forest Department and both agencies have been supplied with sketch maps (1:63,360 scale) to illustrate the proposals for each area. These maps were based on a map prepared by the Forest Department which shows all the logging licences and permits issued in Trengganu Tengah. Both LKTT and the Department have adequate supplies of this map and it is not included as part of this report. Instead, the Consultants' proposals have been summarised in tabular form (Tables 9.6 and 9.7). Areas committed for development prior to the present study are dealt with in one table and areas proposed for development by the Consultants are shown in the other.

The log outturn is arbitrarily based on a spread of two years (¼ in the year of release, ½ in the previous year and ¼ in the year before that). A total area of over 309,000 acres is involved covered by 128 licences and permits (Tables 9.9 and 9.10).

The programmes take into account sawmill agreements and let them set the pace. Some companies with agreements have agreed to harvest faster than they legally need. Mutual arrangements of this kind are excellent but cannot be brought into a planned programme because of legal considerations. Such areas amount to only 11,666 acres compared with a total Forest Department involvement of 304,657 acres (Table 9.8) or less than 4 percent.

No bottlenecks to agricultural development have been identified except in the case of Area 110 where the programme release of agreement areas is tight. However, only part of this area is recommended for development (see Chapter 8) and the agreement areas concerned are mostly on marginal land which is not immediately involved.

Table 9.6 Release of Land for Agricultural Development — Committed Areas

Area No. (1)		Present Position: Licences (L) and Permits (P) affected	Acreage Released at 1974	Release by 30th June in year 1975	1976	1977	1978	1979	1980	Total
			Acres							
101 to 107		Cleared	42,116							42,116
108	i)	Released: P12/72, 13/72, 42/72, 36/72*, 18/70, 14/71	9,700							9,700
	ii)	Exploitation in progress: L88/71, P52/73, 10/73*, 11/73*, 11/72*, 29/72*, 6/73*, release 1975; P13/73, release 1976.		5,460	1,900					7,360
	iii)	Retendering required: P2/68*, 11/62*, 1/62*, 15/59, 8/60, L2/70, P6/65, 10/72, 4/61, release 1976			4,240					4,240
109	i)	Released: P36/72*	2,360							2,360
	ii)	Under exploitation: P29/72*, 6/73*, 51/73*, 40/72*, 11/73, release over three years, 1975 to 1977		360	1,160	600				2,120
110	i)	Released: P36/72*	3,500							3,500
	ii)	Under Exploitation: P20/74, 5/74, release 1975		898						898
	iii)	Under agreement, Papan Paka Kerteh, release 800 acres per year, (b) & (c)—1976, (d) & (e)—1977, (f) & (g)—1978, U1—1974(h)* 1980			810	1,000	850	662	370	3,692
	iv)	Under agreement, Eastern Sawmills; A*—1975, B*, C*, D*, —1976; U 1977; E*1978 (assuming extension of agreement)		470	590	520	330			1,910
111	i)	Released: L73/69*, 70/69	3,670							3,670
	ii)	Under exploitation: L60/69, P15/73*, 16/73, L59/69*, P14/73, 32/73, 20/73* release 1975		7,030						7,030
	iii)	Under exploitation: L41/73, 70/73, 85/73, 97/73, P42/73, release 1976.			6,300					6,300
	iv)	Under exploitation: L69/73, 48/73, 47/73 release 1977				3,000				3,000
	v)	Virgin Forest: 4,000 acres to be offered for tender 1975: release 1977				4,000				4,000
112,115,116,117		Released	27,392							27,392
113		Release: P22/72, 7/73, 3/73, 23/72, 16/72, 18/72	6,140							6,140
114		Released:	2,485							2,485
118		Released: L42/66*, 6/69*, P28/27*	3,597							3,597
119	i)	Released: L42/66, 6/69*, P28/72*	2,700							2,700
	ii)	Under exploitation: P28/73, release 1974; P29/73, L90/72, release 1975; L68/70* release 1977	1,000	1,960		330				3,290
	iii)	Agreement area, Perusahaan Pemburong: release 1976 & 1977			2,857	1,943				4,800
120	i)	Under exploitation: L6/69*, release 1975 to 1977		220	430	630				1,280
121 to 123		Released	27,820							27,820
		TOTAL	132,480	16,398	18,287	12,023	1,180	662	370	181,400

(1) See Fig. 6.1.
* Only part of the Licence or Permit area involved.

Table 9.7 Release of Land for Agricultural Development — Proposed Areas

Area No. (1)		Present Position: Licences and Permits Affected	Acreage Released at 1974	Released by 30th June in year												
				1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	Total
			Acres													
1		Cleared:	1,024													1,024
2		Cleared:	908													908
3		Under exploitation: L8/67, available 1975		512												512
4		Cleared: L37/72, 2/73	1,344													1,344
5	i)	Under exploitation: P45/73* release 1975; P2/74, 3/74, 8/74* release 1976: Secondary growth (798 ac.)	798	450	1,100											2,348
	ii)	Under agreement Leong Huat: (a) 600 ac. (b) 250 ac. release 1977; (c) 750 ac. release 1978				850	750									1,600
	iii)	Treated Forest: release 1979						1,300								1,300
6		Cleared:	1,760													1,760
7		Within Dungun Complex: probably available 1978					1,536									1,536
8	i)	Under exploitation: L56/72 — release 1975 if wanted		1,200												1,200
	ii)	Dungun Timber Complex: release 1980									2,750	4,000	4,000	2,069		12,819
9		Dungun Timber Complex: release 1982 (or earlier)									1,250					1,250
10		Dungun Timber Complex: release 1984 (or earlier)												1,931	5,781	7,712
11		Dungun Timber Complex: release 1984 (or earlier)											992			992
12	i)	Under exploitation: L11/74*, 12/74*, 5/72*, 6/73*: release 1976			2,071											2,071
	ii)	Not under exploitation: L37/67* (400 ac.) check for timber; Jengai FR call tenders: release 1977				700										700
13		Not under exploitation: call tenders, fell 1975 to 1977, release 1977 to 1979				2,500	3,000	2,300								7,800
14		Dungun Timber Complex: FD Survey for excision 1975, log in 1976 to 1977, release 1978					1,670									1,670
15		Non-Forest: available now	2,208													2,208
16	i)	Under exploitation: P21/72*, 44/72, 27/73, 57/73, 19/74*, release 1975; P14/72, 10/74, 20/72, release 1976		5,120	2,160											7,280
	ii)	Under exploitation: P19/72: Forest Reserve Proposal procedure — 1,200 ac.														
	iii)	Not yet under exploitation: 326 ac. add to P14/72, release 1976; fell 1975, release 1977		326	2,800											3,126
17	i)	Under Exploitation: P46/73, 20/72*, 2/73, 45/70, 47/73, release 1976; P18/74, release 1977; P16/74, 12/74, 36/73, release 1978			3,000	810	2,420									6,230
	ii)	To be re-tendered: P18/71, 8/71, 26/72, 43/72; to release 1976; P10/62 release 1978			2,150		560									2,710
	iii)	Poor Forest and mapping	1,479													1,479
18	i)	Under exploitation: P30/72*, 10/69*, release 1975		800												800
	ii)	Poor Forest	307													307
19	i)	Exploitation complete	265													265
	ii)	Under exploitation: P4/72, 34/72, 35/72, release 1975		1,570												1,570
	iii)	For tender P7/60*, (a) & (b), release 1977; (c) &(d), release 1976			2,010	2,600										4,610
20		Under exploitation: L6/60*, release 1976			1,920											1,920
21	i)	Exploitation complete: L35/72, 3/64, 12/70	2,539													2,539
	ii)	Under exploitation: L15/63, 38/73, 13/74, 6/70, 39/69, release 1975		5,425												5,425
	iii)	Poor Forest	381													381
22	i)	Exploitation complete: L40/69 and poor forest	3,140													3,140
23	i)	Exploitation complete: L31/72, 63/72 and poor forest	1,856													1,856
	ii)	Under exploitation: L29/73*, 7/72*, 76/72*, release 1978; L5/64 part release 1976 and part 1977			1,000	2,840	1,690									5,530
24	i)	Exploitation complete: L42/66, 36/73, 27/69, 35/73	3,690													3,690
	ii)	Under exploitation: L90/72, release 1976; L18/72, 31/73, 19/69, release 1977			3,052	1,220										4,272
25	i)	Exploitation complete: L31/72, 28/68, 11/70	3,560													3,560
	ii)	Exploitation in progress: L5/64, release 1977-78			1,200	2,018										3,218
26		Non forest (mostly old mining land)	1,646						832							832
27		Retender L68/70* in 1977 for release 1979				313										313
28		Retender L58/67 in 1974 for release 1976	500													500
29	i)	Exploitation complete: L42/66*		1,054												1,054
	ii)	Exploitation in progress: L6/69*, release 1975		700												700
30	i)	Under exploitation: L24/72*, P22/74, 6/72, release 1975														2,711
	ii)	Under agreement: Perusahaan Pemborong Kemaman; 800 ac. a year available from 1975				800	800	800	311							840
31		Under exploitation: L106/69, release 1975		840												
32	i)	Under exploitation: P56/73, 64/73, 26/73, could be available 1975, but too small an area														
	ii)	Remainder in Kemaman Timber Complex; phasing after 2nd harvest (year 2,000 +)														
33		All within, Kemaman Timber Complex; phasing after 2nd harvesting (year 2,000 +)														
		TOTAL	27,404	17,997	23,576	14,338	12,426	4,743	—	—	4,000	4,000	4,992	4,000	5,781	123,257

(1) See Fig. 8.1.

* Only part of Licence or Permit areas involved.

Table 9.8 Summary of Proposed Release of Land and Log Yield from Agricultural Development Areas

	to 1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	TOTAL
ACREAGE –														
Committed Areas (Table 9.6)	132,480	16,398	18,287	12,023	1,180	662	370	–	–	–	–	–	–	181,400
Proposed Areas (Table 9.7)	27,404	17,997	23,576	14,338	12,426	4,743	–	–	4,000	4,000	4,992	4,000	5,781	123,257
TOTAL	159,884	34,395	41,863	26,361	13,606	5,405	370	–	4,000	4,000	4,992	4,000	5,781	304,657
YIELD – (000's tons)														
Estimated total yield @ 11 tons/acre	1,759	378	46	290	150	59	4	–	44	44	55	44	64	–
Estimated total yield over 2 years	371	397	398	162	68	17	12	33	47	50	52	43	16	–

Table 9.9 Forest Licence Areas on Land for Agricultural Development

	Licence No.	Involved Area (acres)	Area No.
1.	6/60	1,920	20
2.	15/63	2,500	21
3.	3/64	920	21
4.	5/64	3,840	23
		3,218	
5.	42/66	2,030	119
		500	29
6.	8/67	512	3
7.	37/67	400	12
8.	58/67	313	28
9.	28/68	2,110	25
10.	6/69	370	119
		1,280	120
		1,554	29
11.	19/69	380	24
12.	27/69	330	24
13.	39/69	1,140	21
14.	40/69	3,140	22
15.	59/69	700	111
16.	60/69	1,100	111
17.	70/69	2,170	111
18.	73/69	1,300	111
19.	106/69	840	31
20.	2/70	300	108
21.	6/70	170	21
22.	11/70	990	25
23.	12/70	896	22
24.	68/70	832	27
25.	88/71	2,110	108
26.	5/72	200	12
27.	7/72	230	23
28.	18/72	250	24
29.	24/72	200	19
30.	28/72	265	19
31.	31/72	650	23
		460	25
32.	35/72	723	21
33.	37/72	960	4
34.	63/72	910	23
35.	76/72	810	23
36.	90/72	3,052	24
		960	119
37.	2/73	384	4
38.	6/73	1,471	12
39.	29/73	650	23
40.	31/63	590	24
41.	35/73	990	24
42.	36/73	1,360	24
43.	38/73	685	21
44.	41/73	2,000	111
45.	47/73	1,000	111
46.	48/73	1,000	111
47.	69/73	1,000	111
48.	70/73	1,000	111
49.	86/73	500	111
50.	97/73	1,800	111
51.	11/74	100	12
52.	12/74	300	12
53.	13/74	930	21
TOTAL		242,636	

Table 9.10 Forest Permit Areas on Land for Agricultural Development

	Permit No.	Involved Area (acres)	Area No.
1.	7/60	860	19
2.	8/60	250	108
3.	1/62	200	108
4.	4/62	1,300	108
5.	10/62	560	17
6.	11/62	200	3
7.	6/65	300	108
8.	2/68	800	108
9.	10/69	300	18
10.	15/69	500	108
11.	18/70	800	108
12.	8/71	360	17
13.	14/71	300	108
14.	18/71	410	17
15.	4/72	200	19
16.	10/72	390	108
17.	11/72	400	108
18.	12/72	1,000	108
19.	13/72	1,000	108
20.	14/72	960	16
21.	16/72	1,000	113
22.	18/72	1,000	113
23.	19/72	1,200	16
24.	20/72	200	16
25.	21/72	920	16
26.	22/72	1,000	113
27.	23/72	1,000	113
28.	26/72	500	17
29.	28/72	300	119
30.	24/72	(120	109
		(1,000	108
31.	30/72	500	18
32.	34/72	570	19
33.	35/72	800	19
34.	36/72	(2,360	109
		(2,500	108
35.	40/72	680	109
36.	42/72	3,000	108
37.	43/72	880	17
38.	44/72	1,000	16
39.	3/73	1,000	113
40.	6/73	(250	108
		(240	109
41.	7/73	1,000	113
42.	10/73	450	108
43.	11/73	(6,000	109
		(400	108
44.	13/73	900	108
45.	14/73	1,000	111
46.	15/73	1,330	111
47.	16/73	1,000	111
48.	20/73	900	111
49.	26/73	1,000	32
50.	27/73	1,000	16
51.	28/73	1,000	119
52.	29/73	1,000	119
53.	32/73	1,000	111
54.	36/73	560	17
55.	42/73	1,000	111
56.	45/73	450	5
57.	46/73	1,180	17
58.	47/73	750	17
59.	51/73	480	109
60.	52/73	850	108
61.	56/73	956	32
62.	57/73	1,000	16
63.	63/73	840	32
65.	3/74	350	5
66.	5/74	534	110
67.	6/74	400	30
68.	8/74	400	5
69.	10/74	1,000	16
70.	12/74	1,150	17
71.	16/74	710	17
72.	18/74	810	17
73.	19/74	1,200	16
74.	20/74	364	110
75.	22/74	100	30
TOTAL		66,524	

9.4 Output and Marketing

The market for Malaysian forest resources divides into logs, sawnwood, chips, plywood and other products requiring varying degrees of manufacture. Exports of both logs and sawnwood from West Malaysia increased in volume terms by 15 percent per year in the ten years ended 1972. Recently, however, the rise in price of sawnwood has been much more rapid than that of logs. Between 1968 and 1972 the volume of logs exported rose 25 percent although the value of log exports grew by no more than 8 percent. During the same period sawnwood exports expanded by 29 percent in volume terms and by 86 percent in value. Plywood exports from West Malaysia increased by more than 250 percent in this period in both volume and value terms although there was a marginal decline in unit price.

Despite the currently somewhat depressed market for logs, timber and plywood the long term market for Malaysian sawnwood and manufactured products is considered good.[110] There will, however, be increasing competition from Indonesia, the Philippines, West Africa and South America. The success of Malaysian exports will therefore depend on reliability of supply and consistency of quality. As a greater proportion of output in Trengganu Tengah increasingly comes from logged over areas so the necessity will increase for greater skills in sawmill operation and export marketing.

Estimation of output in Trengganu Tengah is difficult because of the absence of reliable figures relating to outturn per acre. On the assumption that fully marketable timber will be removed down to 18" diameter an average yield of 11 FD tons per acre is expected to be achieved (Table 6.6). The installation of gangsaws in the Dungun Complex may make conversion of smaller material from limited areas possible in the future, but most of such material will be burned.

The total annual output of logs from the agricultural clearance areas will remain high until 1977 when production is likely to fall significantly (Table 9.4 and Fig. 9.2). Although production from the forest reserve areas will rise total annual log output from within Trengganu Tengah will fall from 1977 onwards until a stable level is obtained in 1986.

With the development of the Dungun forest complex the proportion of output processed within Trengganu Tengah will rise rapidly. By 1990 it is estimated that 55 percent of total log production will go through the Dungun Complex with an additional 16 percent through the Kemaman Complex. As the throughput of the new sawmill complex increases so the importance of marketing alters from that of selling logs to that of selling quality sawnwood.

The greatest potential for future development appears to lie in raising the export of quality sawnwood, plywood, mouldings and other manufactured products. Progress along these lines in Trengganu Tengah will increase the value added to timber harvested from the local forest reserve areas.

9.5 Employment

The additional direct employment in forestry production and processing is likely to rise by approximately 500 between 1975 and 1990 excluding any allowance for processing activities other than sawmilling and kiln drying at the new complex and also excluding the felling and bucking done by contract labour.

The estimated build-up in additional direct employment is given in Table 9.11.

Table 9.11 Employment Logging and Sawmilling 1975 – 1990 Dungun Complex

	1975	1980	1985	1990
Logging				
Road Construction + Logging	–	60	127	127
Maintenance	–	10	20	20
Management and surveys	–	40	76	76
Sub-total logging	–	110	223	223
Sawmill				
Management	–	9	18	18
Skilled Workers	–	23	46	46
Unskilled Workers	–	89	178	178
Sub-total Sawmill	–	121	242	242
TOTAL COMPLEX		231	465	465

CHAPTER 10

Proposed Industrial Development

10. PROPOSED INDUSTRIAL DEVELOPMENT

10.1 General

At present there would appear to be little opportunity for introducing industrial development to Trengganu Tengah other than that associated with oil palm and rubber cultivation and sustained forest exploitation. There is a possibility, once the agricultural base of the area and adequate infrastructure have been developed and substantial modern townships established, that industry can be induced to locate in Trengganu Tengah through a deliberate policy of dispersal as at present followed by the various Federal Government agencies engaged in the promotion of industrial development. Initially however we do not feel that this policy would meet with much success in Trengganu Tengah.

Our reasons for this conclusion are the present disadvantages of Trengganu Tengah, which cannot easily be overcome for a considerable time and the strong counter attraction of potential growth poles such as Kuala Trengganu and the new port at Tanjong Gelang. Kuala Trengganu is potentially attractive to investors because it is the administrative centre of the State and is rapidly growing into a modern urban area. It already supplies substantial technical and commercial services and has an adequate communications network. Present and committed future development will provide additional urban amenities such as more hotel rooms and a wider choice of housing and shopping facilities. Kuala Trengganu is thus attractive both to industrialists, for whom it can provide basic services with the prospects of considerable improvement and to management staff and skilled workers for whom it can provide the basic urban amenities. The possibility of substantial offshore oil deposits being established further enhances the potential of Kuala Trengganu as an important industrial development centre.

Tanjong Gelang will be attractive for a different reason. The new port, as well as providing access for the import of raw materials and export of finished products, will occasion a very large injection of capital, labour and technical expertise to the area. This will lead to a rapid build up of such essential industrial services as roads, power and water supply and the various technical skills and services associated with a major port. By about 1980 the basic prerequisites for industrialisation on a substantial scale will be readily available and the area should be an attractive one for the location of industrial plant.

The creation of an industrial estate in Trengganu Tengah, with a strong counter pull to the natural attractions of the urban coastal area or the induced ones of Tanjong Gelang would require a massive immediate investment to provide the equivalent industrial services and urban amenity. Such a policy if pursued in the early stages of development would probably represent a substantial misallocation of resources. The existence of three major industrial areas within a distance of approximately 100 miles would provide more industrial amenity than potential industries to use it.

However, in the future, once industrialisation has been established at a certain level on the coast and the basic amenities of Trengganu Tengah have been built up through agricultural development, a policy of industrial dispersal to the interior will become much more relevant. Between 1985 and 1990, industrialisation could have reached such a level in the coastal areas that further development would lead to increasing congestion, pollution and loss of scenic amenity. Furthermore, the gap in terms of income and job opportunity between the agricultural hinterland and the urban coastal areas would begin to widen once the initial agricultural development has been completed. At this juncture Trengganu Tengah could begin to be considered an area suitable for industrial dispersal.

The major objective of present planning and implementation should be to provide the basis for the smooth transition of a primarily agriculturally based area to one supporting both industry and agriculture. We feel that this basis can be most easily achieved if agriculture and timber processing industries are grouped in a rationalized way to create a community which is potentially attractive for further industrial investment. It is thus envisaged that palm oil mills, rubber factories and sawmill complexes should be located in areas where there are already substantial centralised settlements based on agriculture. In this way a fairly diverse and sophisticated urban community can be created which is a potentially attractive place for new industry to locate. Grouping of agricultural settlement and processing in a relatively large urban community pre-supposes a fairly high level of basic services such as roads, housing, water supply, power supply and provides a concentration of people with attitudes and skills which are amenable to further industrialisation. A series of small communities, based primarily on agricultural settlement with processing units located in a scattered way on individual projects could not provide the spread of services and amenities which would attract industrial development.

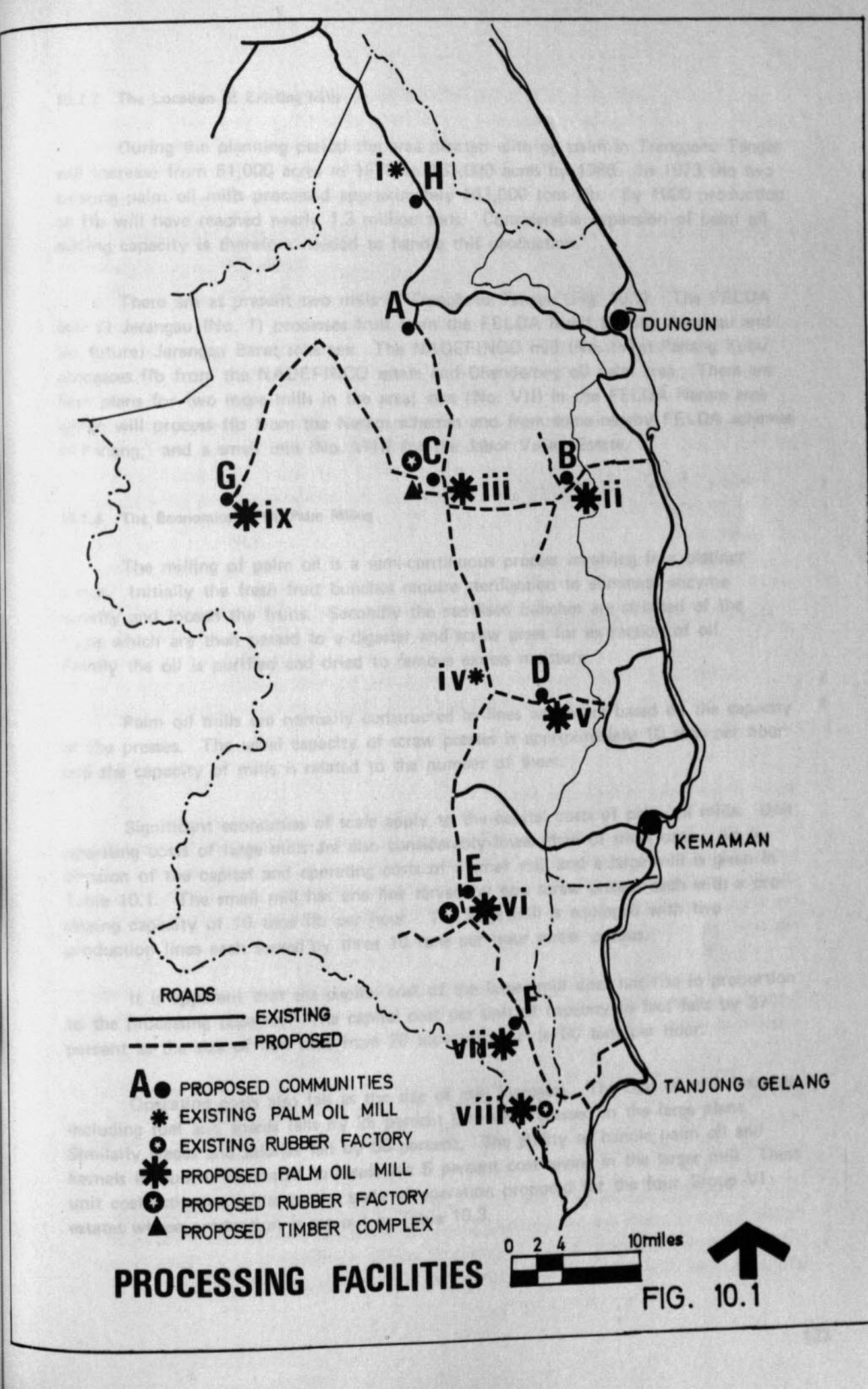
This chapter sets out the industrial possibilities in Trengganu Tengah up to 1990 based on palm oil processing, rubber processing and timber conversion. Investment, siting and employment are considered in the light of the foregoing comments relating to community development, and the aims of establishing urban centres above certain minimum threshold sizes as described in Chapter 12.

10.2 Oil Palm Processing

10.2.1 Introduction

Oil palm is to be the most important agricultural crop in Trengganu Tengah during the planning period in terms of acreage, employment and value added. Further processing of the crop offers potential for substantially increasing the total value of output from within the region.

This section describes the existing situation and recommends a phased expansion of milling facilities based on the concept of Mill Centralisation. The proposed development of palm oil mills set out in this Report is however subject to the results of a feasibility study which the Consultants strongly recommend is undertaken immediately.



PROCESSING FACILITIES

FIG. 10.1

10.2.2 The Location of Existing Mills

During the planning period the area planted with oil palm in Trengganu Tengah will increase from 51,000 acres in 1973 to 163,000 acres by 1986. In 1973 the two existing palm oil mills processed approximately 163,000 tons ffb. By 1990 production of ffb will have reached nearly 1.3 million tons. Considerable expansion of palm oil milling capacity is therefore needed to handle this production.

There are at present two mills in Trengganu Tengah (Fig. 10.1). The FELDA Mill at Jerangau (No. 1) processes fruit from the FELDA Bukit Bading, Jerangau and (in future) Jerangau Barat schemes. The NADEFINCO mill (No. IV) at Padang Kubu processes ffb from the NADEFINCO estate and Chenderong oil palm area. There are firm plans for two more mills in the area; one (No. VII) in the FELDA Neram area which will process ffb from the Neram schemes and from some nearby FELDA schemes in Pahang; and a small mill (No. VIII) for the Jabor Valley Estate.

10.2.3 The Economics of Oil Palm Milling

The milling of palm oil is a semi-continuous process involving four distinct stages. Initially the fresh fruit bunches require sterilisation to eliminate enzyme activity and loosen the fruits. Secondly the sterilised bunches are stripped of the fruits which are then passed to a digester and screw press for extraction of oil. Finally the oil is purified and dried to remove excess moisture.

Palm oil mills are normally constructed in lines which are based on the capacity of the presses. The usual capacity of screw presses is approximately 10 tons per hour and the capacity of mills is related to the number of them.

Significant economies of scale apply to the capital costs of palm oil mills. Unit operating costs of large mills are also considerably lower than of small ones. An indication of the capital and operating costs of a small mill and a large mill is given in Table 10.1. The small mill has one line served by two screw presses each with a processing capacity of 10 tons ffb per hour. The large mill is equipped with two production lines each served by three 10 tons per hour screw presses.

It is apparent that the capital cost of the larger mill does not rise in proportion to the processing capacity. The capital cost per unit of capacity in fact falls by 37 percent as the size of mill rises from 20 tons per hour to 60 tons per hour.

Operating costs also fall as the size of mill increases. The cost of mill materials including fuel and spares falls by 25 percent per ton processed in the large plant. Similarly wages and salaries fall by 60 percent. The ability to handle palm oil and kernels in bulk is estimated to result in a 5 percent cost saving in the larger mill. These unit cost estimates relate to the scale of operation proposed for the four Group VI estates whose production is set out in Table 10.3.

Table 10.1 Palm Oil Mill Capital and Operating Costs

Mill Capacity (Tons/Hour)	20	60
Capital Costs		
Total Capital Cost of Mill	6,806,000	12,926,000
Unit Capital Cost (per ton/hour)	340,300	215,433
Processing Costs ($ per ton FFB)		
Materials	4.90	3.68
Salaries	3.60	1.20
Wages	2.10	1.10
Transport and Distribution Costs Palm Oil ($ per ton of oil)		
Labour	3.66	3.48
Transport and storage	18.19	17.28
Kernels ($ per ton of kernels)		
Labour	3.50	3.33
Transport and storage	13.00	12.35

Source: FELDA 1974 cost estimates.

10.2.4 The Concept of Centralised Milling

The concept of centralising the new palm oil mills in Trengganu Tengah is put forward by the Consultants as a means of meeting several of the basic regional development objectives. Centralisation reduces the total number of mills thus reducing the total capital cost and relieving the strain on the scarce engineering capacity required for mill construction.

The siting of mills near the proppsed townships enables employees to benefit from the advantages of urban living. The towns themselves benefit from the additional population which reduces the unit costs of providing services.

Centralising milling in fewer larger mills also helps in reducing the effects of pollution. The Consultants believe that the unit costs of modern pollution control systems fall significantly with larger mills thus making it more economic to treat the effluent from large mills.

The establishment of a few large mills operated independently of individual estates makes it easier for small producers to participate in the benefits from both growing and processing oil palm. This should enable the benefits to be spread more widely through the rural community than would otherwise be the case.

There are however likely to be problems associated with the centralising of oil palm mills. These include the extra cost of transportation to the mill and the difficulty of co-ordinating fruit delivery from several different producers. It is hoped that the proposed feasibility study will resolve these problems.

10.2.5 Economics of Centralised Milling

In order to assess the benefits resulting from centralised milling the returns from a specific group of estates have been compared assuming in one case the use of one central mill and in the other that each estate processes its output through its own individual mill. For this purpose four estates covering 22,500 planted acres have been chosen. They are blocks 119, 23, 24 and 25 as shown in Fig. 8.1.

The cash flow over a 25 year period for these estates each with its own mill is shown in Table 10.3. The cash flow for the same four estates with one central mill is set out in Chapter 15, Table 15.4. The scale economies resulting from centralising the milling of total production from the four estates are shown in Table 10.4.

Gross Revenue

The gross output of the four estates is derived from the estimated output given for Group VI estates in Table 8.38. The gross revenue from palm oil sold at $600 per ton and palm kernels at $400 per ton is equivalent to $136 per ton of ffb. For purposes of this analysis it is assumed that the gross revenue will be the same whether processing is decentralised or carried out in one central mill.

Estate Costs

Siting mills off the producing estates will increase the cost of transporting ffb to the mill and also raise the investment required for vehicles. It is estimated that one additional 5 ton lorry will be required for each 5,000 acres planted to oil palms. The additional cost of this investment and its replacement raises the cost of field administration by the amount shown in Table 10.4.

The harvesting costs are estimated to rise by $1.00 per ton representing the additional mileage involved in serving one central mill. Total field labour costs remain unchanged while transport costs rise 45 percent as shown in Table 10.2 below.

Table 10.2 Oil Palm Harvesting Costs

	Centralised Milling	Decentralised Milling
Labour Costs ($ per ton ffb)	6.52	6.52
Transport Costs ($ per ton ffb)	3.23	2.23

Source: Trengganu Tengah Study.

Milling Costs

The basis for estimating the capital costs of mills is set out in Table 10.1. The mill capital costs in Table 10.3 relate to four separate mills each of 20 tons per hour capacity. The mill capital costs in Table 15.4 relate to one centrally sited mill of 60 tons per hour capacity which is considered large enough to handle the peak output from the four estates. The annual cost of repairs and replacements is included under the cost of materials. This is estimated to fall by $1.22 per ton with centralisation.

Reference to Table 10.4 shows that significant savings are achieved in mill labour costs which include both salaries and wages. This is because one 60 ton mill on two shift working employs a total staff of 109 compared with 260 for four mills on two shift working.

The savings achieved in transport and distribution are relatively small. It is estimated that the unit costs of bulk handling the output from the large mill will be 5 percent lower than from the smaller mill.

Returns to Scale

The cost savings summarised in Table 10.4 are derived by calculating the difference in costs of decentralised milling (Table 10.3) and centralised milling (Table 15.4).

Reference to Tables 10.3 and 15.4 reveals that the internal rate of return on total investment in oil palm production with decentralised milling is significantly lower than with centralised milling. The rate of return to centralised milling before deducting housing costs is approximately 21.5 percent whereas the additional costs of providing separate mills on each estate reduce the rate of return in this case to 16 percent. Deducting the costs of providing housing reduces the returns to 18 percent and 14 percent respectively.

The principal saving in cost resulting from centralising mills is the capital cost of the mills themselves. Not only is there a straight saving in capital costs but with one large mill expenditure on enlarging capacity can be deferred until years 8 and 9 whereas with decentralised mills all initial capital investment is completed by Year 7.

Although the costs of estate transportation increase with centralised milling these extra costs are more than compensated by the lower costs of mill materials and end product transportation. The saving in salary and wage costs is large at $10.9 million but even without taking this item into account the undiscounted savings total $16.1 million over the whole period.

On the basis of the information available the economic advantages of centralising milling are substantial. There are however problems regarding organisation and grower participation in milling benefits which are discussed in Section 10.2.6.

Table 10.3 Cash Flow for Group VI Oil Palm Estates with Decentralised Mills

Year	Gross Output	Gross Revenue	Housing (capital and (maintenance)	Field Costs Excluding Labour	Field Labour Costs	Field Management Costs	Field Administrative Costs	Mill Operation: Mill Capital Cost	Mill Operation: Labour and Management	Mill Operation: Materials	Mill Operation: Transport and Distribution	Net revenue before duties and interest: Including Housing Costs	Net revenue before duties and interest: Excluding Housing Costs
	tons ffb	$000											
0	–	–	264	1	37	17	59	–	–	–	–	– 378	– 114
1	–	–	600	200	272	55	135	–	–	–	–	– 1,262	– 662
2	–	–	1,184	534	662	129	263	–	–	–	–	– 2,772	– 1,588
3	–	–	1,780	1,268	1,331	240	390	200	–	–	–	– 5,209	– 3,429
4	281	38	1,527	2,522	2,066	332	326	6,806	2	1	1	– 13,545	– 12,018
5	2,889	393	983	2,948	2,397	388	199	6,806	16	14	15	– 13,373	– 12,390
6	11,966	1,627	518	3,488	2,522	405	59	6,806	68	59	60	– 12,358	– 11,840
7	31,804	4,324	130	3,458	2,535	405	18	6,606	181	156	160	– 13,649	– 13,519
8	66,286	9,015	130	3,383	2,658	405	40	–	378	325	333	1,363	1,493
9	110,368	15,010	130	3,274	2,751	405	78	–	629	541	555	6,647	6,777
10	152,236	20,704	130	3,342	2,729	405	117	–	868	746	766	11,601	11,731
11	182,631	24,838	130	3,299	2,620	405	98	–	1,041	895	919	15,431	15,561
12	197,483	26,858	130	3,317	2,499	405	59	–	1,126	968	993	17,361	17,491
13	202,321	27,516	130	3,353	2,423	405	18	–	1,153	991	1,018	18,025	18,155
14	202,790	27,579	130	3,359	2,385	405	–	–	1,156	994	1,020	18,130	18,260
15	202,509	27,541	130	3,344	2,376	405	18	–	1,154	992	1,019	18,103	18,233
16	201,571	27,414	130	3,339	2,376	405	40	–	1,149	988	1,014	17,973	18,103
17	199,446	27,125	130	3,342	2,376	405	78	–	1,137	977	1,003	17,677	17,807
18	195,321	26,564	130	3,346	2,376	405	117	–	1,113	957	982	17,138	17,268
19	189,196	25,731	130	3,352	2,376	405	98	–	1,078	927	952	16,413	16,543
20	184,071	25,034	130	3,357	2,376	405	59	–	1,049	902	926	15,830	15,960
21	180,008	24,481	130	3,361	2,376	405	18	–	1,026	882	905	15,378	15,508
22	176,000	23,936	130	3,365	2,376	405	–	–	1,003	862	885	14,910	15,040
23	172,000	23,392	130	3,369	2,376	405	18	–	980	843	865	14,406	14,536
24	168,000	22,848	130	3,373	2,376	405	40	–	958	823	845	13,898	14,028
25	164,000	22,304	130	3,377	2,376	405	78	–	935	804	825	13,374	13,504
								Internal rate of return (percent)				14.0	16.0

Table 10.4 Scale Economies of Centralising Group VI Palm Oil Mills

Year	Reduction in Annual Costs						Additional Cash Flow
	Field Transport	Field Administration	Mill Capital	Mill Labour	Mill Materials	Transport and Distribution	
	$'000						
0	–	– 6	–	–	–	–	–6
1	–	– 13	–	–	–	–	–13
2	–	– 25	–	–	–	–	–25
3	–	– 37	–	–	–	–	–37
4	–	– 31	200	1	–	–	170
5	– 3	– 19	6,806	9	3	2	6,798
6	– 12	– 6	6,806	40	15	5	6,848
7	– 32	– 2	6,606	108	39	14	6,733
8	– 66	– 4	– 1,872	226	81	28	– 1,607
9	– 110	– 8	– 4,248	375	135	47	– 3,809
10	– 152	– 11	–	518	186	66	607
11	– 182	– 9	–	621	223	79	732
12	– 197	– 6	–	672	241	85	795
13	– 202	– 2	–	688	246	87	817
14	– 203	–	–	690	248	87	822
15	– 203	– 2	–	689	247	87	818
16	– 202	– 4	–	685	246	87	812
17	– 199	– 8	–	678	243	86	800
18	– 195	– 11	–	664	238	84	780
19	– 189	– 9	–	643	231	82	758
20	– 184	– 6	–	626	225	79	740
21	– 180	– 2	–	612	220	77	727
22	– 176	–	–	598	214	75	711
23	– 172	– 2	–	584	210	74	694
24	– 168	– 4	–	572	205	72	677
25	– 164	– 8	–	558	200	71	657
TOTAL	– 3,191	– 235	14,298	10,857	3,896	1,374	26,999
NPV at 10%							11,721

10.2.6 Evaluation of Centralised Milling

The previous section has set out in detail the economic and financial benefits from centralising palm oil mills. Other less quantifiable costs and benefits have been mentioned above in Section 10.2.4 The Consultants would here like to draw attention to certain other aspects of mill centralisation.

In addition to the economic benefits already mentioned it is likely that the adoption of centralised milling will reduce the demand for managerial and skilled personnel during the years when such people are likely to be in short supply not only in Trengganu but within Malaysia as a whole. The unit cost of pollution control falls rapidly with larger mills thus reducing the total cost of effluent treatment and also increasing the probability that such treatment will be effected.

Centralised milling of ffb from several individually managed sources requires objective control of the milll operations to ensure that all producers get a fair deal regardless of their size. The Consultants suggest that an oil palm milling corporation should be established to control the operations of the three proposed group mills. Each estate in group would hold equity in proportion to its planted acreage but ultimate control would rest in the hands of non-producers who would control operations and handle sales of oil. It is suggested that LKTT and SEDC would comprise this controlling body, the former through equity holding and overall planning control of the development area; and the latter through equity holding and provision of the managerial and technical staff necessary to run the mills.

The Corporation Board would thus consist of representatives of LKTT, SEDC and the ffb producers. If individual smallholders are encouraged to grow oil palm, their interests would be represented best by a co-operative body such as the FOA.

The production of three large palm oil mills under one management would ultimately be sufficient to support considerable further processing facilities. Initially these could consist of a kernel processing plant and a fractionating plant but in the long term, consumer product manufacture could be established. The value added from these activities would thus be distributed to the primary producers of ffb through their shareholding in the corporation.

It is probable that a further benefit of centralised processing will be the establishment of a realistic market price for oil palm ffb. This development would encourage the production of oil palm by small farmers.

A small farmer interested in growing oil palm would approach his local mill and apply for an acreage allocation for a nominal payment. When his crop reaches maturity his acreage allocation would entitle him to participate, either directly or through a representative, in the decisions of the joint growers and mill operators committee. He would also be eligible to subscribe for equity shares in the mill in proportion to his acreage allocation.

It might well be possible for a government agency such as Bank Pertanian to arrange credit facilities through the oil palm corporation to help small farmers in the early years of establishment. Repayment could then be automatically deducted from the relevant producer returns.

With centralised milling operational control becomes even more critical than with estate milling. It will be essential for mill management to work closely with all producers to ensure smooth delivery to the mill. Close quality control will be essential and for this to be effective all deliveries will have to be easily identifiable as to source. Efficient and rapid lines of communication must exist between field staff and mill staff.

Oil palm producers usually wish to operate their own estate-based mills because they can ensure that the important milling operation remains under their control and they can benefit from the profits on the operation. For centralised milling to operate successfully it is essential that all growers have an equal right to benefit from milling facilities at all times and also that they can participate in milling profits through an equity interest in the mill.

It will be essential to ensure that all producers are able to have their output milled at peak harvesting periods. This will require a certain element of control over deliveries on the part of the mill. In return for accepting this discipline all growers irrespective of size must be assured an equal right to participate in management decisions relating to operational aspects of delivery and quality control. For this producer participation to be effective, mill management must be independent of individual estate influence yet responsive to their collective requirements. Participation could be effected through a committee representing growers and mill operators.

It is recommended that profits from milling are distributed to producers in relation to the size of their production. The equity entitlement will be on an acreage basis with subscription up to a stated maximum. This maximum will be equal to the proportion the individual grower's acreage represents of the total acreage served by the mill less an amount representing the joint interest of LKTT and SEDC in the oil palm Milling Corporation.

In this way it is envisaged that growers will be encouraged to participate in the scheme as they will all have an equal right to be represented in operational decisions while benefitting according to size in the milling profits.

The Consultants recommend that a feasibility study is carried out to evaluate the optimum development of the oil palm processing industry in Trengganu Tengah in the light of its importance to the economy of the region. This study should look closely at the possibilities for establishing palm kernel plants, palm oil fractionating plants and also final product manufacturing facilities. Attention should also be given to the methods of safe-guarding the interests of producers in the running of the proposed palm oil mills as mentioned above. The Terms of Reference for such a study are given in Appendix F.1.

10.2.7 Siting of New Mills

In addition to the two existing mills at Jerangau and Padang Kubu and the two planned in the Neram and Jabor Valley areas, the Consultants have planned another five mills to serve the new oil palm areas (Fig. 10.1). Two of these will be FELDA mills to serve the FELDA Rasau-Kerteh and Pasir Raja schemes respectively and three mills to serve the remaining oil palm projects on the basis of centralised processing which has been discussed previously.

Table 10.5 shows the location of each mill and the areas served. From the yield estimates of oil palm (Table 8.38) a projection has been made of the phased requirement for milling facilities (Table 10.6). At present Jabor Valley Estate sends its ffb to the FELDA mill at Bukit Goh in Pahang. Some of the FELDA oil palm schemes in Pahang will in future send ffb to the FELDA Neram mill. In 1979, it is proposed that the oil palm projects in Group V should send their ffb to the Group VI mill. Group III and Group V will have their own mills in 1980 and 1981 respectively.

Table 10.5 Palm Oil Mills, Location, Ownership and Areas Served

Mill No.	I	II	III	IV	V	VI	VII	VIII	IX
Location	Jerangau	Community B	Community C	Padang Kubu	Community D	Community E	Community F	Jabor Valley	Community G
Owner	FELDA	FELDA	Public	NADEFINCO	Public	Public	FELDA	Jabor Valley Estate	FELDA
Areas Served	Bukit Bading (101)	Rasau Kerteh	RISDA(111)	(15, 112, 115, 116, 117, 118)	OPE–2(16)	OPE–5(23)	Neram I (122)	(123)	Pasir Raja (8, 9, 10)
	Jerangau (106)	(16, 108, 109, 110)	OPE–1(13)		OPE–3(17)	OPE–6(24)	Neram II (121)		
	Jerangau Barat (105)				OPE–4(19) FELCRA (113)	OPE–7(25) Ladang Tenggara (119)	Pahang Schemes		
Acreage (net)	16,037	23,000	23,000	29,560	19,000	22,500	9,698+	4,152	16,336
Present capacity tons/hr. ffb	30	–	–	40	–	–	–	–	–
1st Year in production	In production	1979	1980	In production	1981	1980	1977	1976	1987

10.2.8 Capacity of New Mills

From projected yield figures, the peak monthly crop (15 percent) of annual yield) has been calculated. This figure divided by the 25 days milling per month gives the peak daily throughout required at each mill. Assuming capacity to be in ten ton units, the capacity and the maximum number of shifts needed to handle throughput during the period of peak yield have been calculated (Table 10.6). In four of the mills, critical points are reached when projected throughput exceeds installed capacity. This situation assumes that yields will reach the levels projected and it can be dealt with in two ways: extra capacity can be installed to cope with the peak crops over a few years or excess ffb can be processed in another mill nearby. Decisions along these lines can be taken in the future once the development programme is running and actual yields are observed. Because the Neram mill (VII) will be processing ffb from outside Trengganu Tengah it has not been possible to phase capacity according to projected throughput but a tentative estimate of required capacity has been made. The FELDA mill at Pasir Raja will reach peak throughput in 1994 when installed capacity should be 60 tons/hr.

The number of shifts to be worked is based on the principal of one shift being eight hours milling time, two shifts being sixteen hours milling time and three shifts being twenty hours milling time. During any day there has to be a period of up to four hours allowed for cleaning and maintenance.

10.2.9 Phased mill development

Planning of a palm oil mill must start two years before it is due to come into production. At this stage plans are drawn, tenders called for and plant ordered. Site clearance should begin almost at once and thus it is necessary that all-weather access to the site should be available. The Jerangau-Jabor road will serve most of the planned mills. Those already in existence have reasonable communications by road although in the case of NADEFINCO access will be much improved once the new road is completed. The FELDA mill site (II) at Rasau Kerteh needs access in 1977 and for this reason priority should given to constructing feeder road F5/F6. The site of FELDA Neram Mill (VII) is accessible by logging tracks but it is recommended that the southern end of the new trunk road be installed as soon as possible to provide all-weather access to the site. The Jabor Valley Estate is already served by an existing all-weather road. Development of the mills III, V and VI should coincide with the projected completion of the trunk road system. The FELDA mill at Pasir Raja (IX) will require access by 1985 and it is considered that this area will be served by road before then.

Table 10.6 Trengganu Tengah: Palm Oil Mill Development 1973 – 1990

		Peak Crop Requirement	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
I	FELDA	Tons/day	430	548	580	625	648	690	720	757	812	810	815	797	784	769	750	738	720	712
	Jerangau	Capacity: tons/hour	30	==========		40	==========				*	*	*							→
		No. of shifts	3	9	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3
II	FELDA	1							81	261	495	770	1,006	1,161	1,229	1,247	1,242	1,242	1,242	1,212
	Community B	2					////////////		20	=======	30	40	60	==========	*	*	*	*	*	→
		3							1	2	3	3	3	3	3	3	3	3	3	3
III	GROUP	1							52	189	403	671	923	1,093	1,202	1,231	1,246	1,242	1,242	1,242
	Community C	2						////////////	20	=======	40	60	==========							→
		3							2	3	3	2	3	3	3	3	3	3	3	3
IV	NADEFINCO	1	541	1,004	1,267	1,428	1,494	1,512	1,507	1,507	1,507	1,466	1,424	1,387	1,357	1,339	1,302	1,280	1,276	1,267
	Padang Kubu	2	40	60	80	==========														
		3	2	3	2	3	3	3	3	3	3	3	3	3	3	3	3	3	2	2
V	GROUP	1								54	207	463	743	932	1,017	1,031	1,026	1,026	1,026	1,026
	Community D	2							////////////		20	30	40	60	==========					
		3									2	2	3	2	3	3	3	3	3	3
VI	GROUP	1								71	191	398	662	913	1,096	1,184	1,214	1,217	1,215	1,209
	Community E	2						////////////		20	==========		40	60	==========		*	*	*	*
		3								1	2	3	3	2	3	3	3	3	3	3
VII	FELDA	2			////////////		20	=======	40	=======	60	==========								
	Community F	3					2		3		2		3							
VIII	Jabor Valley Estate	1			41	60	83	113	148	177	208	217	226	224	219	217	215	213	204	200
		2		////////////		10	==========				*	*	*	*	*	*	*	*	*	*
		3				1	1	2	2	3	3	3	3	3	3	3	3	3	3	3
IX	FELDA	1															49	157	297	467
	Community G	2													////////////		10	20	=======	30
		3															1	1	2	2

KEY: * estimated throughput of ffb exceeds installed capacity
===== installed capacity unchanged
//////// planning and construction period (2 years)

10.2.10 The Investment Programme

The total estimated investment required to finance the phased build-up of mills is set out in Table 10.7. The cost estimates are based on the latest available figures for mills of different sizes but actual quotations may vary significantly from these estimates. The cost element most likely to be affected by the current rapid inflation is that of mill construction and plant. This element represents 83 percent of total capital costs of small 20 ton/hr mills and 90 percent of larger 60 ton/hr mills. A 25 percent rise in these costs would thus have an impact on total costs of almost the same proportion.

The phasing of investment in mills is spread fairly evenly in the period 1978 to 1983. The cost of replacement has not been included as this cost does not represent initial investment requirement. Replacement costs representing some 60 percent of initial mill costs are likely to occur in the eighth year of operation.

The return of the total investment in the production and processing of palm oil in Trengganu Tengah is set out in detail in Chapter 15 of this report.

Table 10.7 Trengganu Tengah: Phased Investment in Palm Oil Mills, 1975 – 1990

Group Mill	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	TOTAL
Group I	1,536																1,536
Group II			200	6,606		336	1,536	4,248									12,926
Group III				200	6,606		1,872	4,248									12,926
Group IV																	–
Group V					200	6,606	336	1,536	4,248								12,926
Group VI				200	6,606			1,872	4,248								12,926
Group VII	200	6,606		1,872		4,248											12,926
Group VIII	6,300																6,300
Group IX											200	6,300	306		336		7,142
TOTAL	8,036	6,606	200	8,878	13,412	11,190	3,744	11,904	8,496	–	200	6,300	306	–	336	–	79,608

10.2.11 Manpower Requirements

Using data from FELDA and the Pahang Tenggara Study,[1] estimates of manpower requirements for various sizes of mill have been prepared (Table 10.8). Using these standards the manpower requirements for the present and proposed mills in Trengganu Tengah have been determined (Table 10.9).

By 1990, there will be nine palm oil mills in Trengganu Tengah employing nearly 1,200 people of whom 24 will be managers or assistant managers and 197 will be skilled tradesmen. The availability of skilled personnel is likely to be a critical factor in the mill development programme. As a guide to the demand for skilled manpower in the palm oil processing industry the approximate number of managerial and skilled jobs available on a yearly basis has been calculated (Table 10.10). Availability of clerical staff and unskilled labour is not likely to be a limiting factor in oil mill development.

These manpower projections should be regarded as indicative only. As each new mill is built, the latest labour saving improvements are incorporated thus reducing the manpower requirement.

Table 10.8 Manpower Requirements, Palm Oil Mills

Capacity: tons/hr ffb	20		30		40		60		80	
Position / **No. of shifts**	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**3**	**2**	**3**
Manager (Engineer)	1	1	1	1	1	1	1	1	1	1
Assistant Manager (Engineer)	2	2	2	2	2	3	3	3	3	3
Sub-total – Managerial	3	3	3	3	3	4	4	4	4	4
Senior Production Supervisor	1	1	1	1	1	1	1	1	1	1
Production Supervisor	1	1	1	1	1	1	2	2	2	2
Senior Foreman	1	1	1	1	2	2	2	2	2	2
Foreman	2	2	2	2	3	3	3	3	3	4
Fitters	4	4	4	4	5	5	6	6	6	6
Electrician	2	3	2	3	2	3	3	3	3	3
Boiler House Mechanic	4	4	4	4	4	6	6	6	6	6
Laboratory Assistant	1	1	1	1	1	1	1	1	2	2
Sub-total – Skilled	16	17	16	17	19	22	24	24	25	26
Senior Clerk	1	1	1	1	1	1	1	1	1	1
Typist-Clerk	1	1	1	1	1	1	2	2	2	2
Storekeeper	1	1	1	1	2	2	2	2	3	3
Sub-total – Clerical	3	3	3	3	4	4	5	5	6	6
Watchman	3	3	3	3	3	3	6	6	6	6
Unskilled Labour	40	60	49	69	56	80	70	112	80	120
Sub-total – Unskilled	43	63	52	72	59	83	76	118	86	126
TOTAL	65	86	74	95	85	113	109	151	121	162

Table 10.9a Trengganu Tengah: Manpower Requirement for Palm Oil Mills

Mill No.	I					II					III			IV			
Year	1973	1974	1977	1979	1980	1981	1982	1983	1980	1981	1982	1983	1984	1973	1974	1975	1976
Capacity: ton/hr ffb	30	40	40	20	20	30	40	60	20	20	40	60	60	40	60	80	80
No. of Shifts	3	2	3	1	2	3	3	3	2	3	3	2	3	2	3	2	3
Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Assistant Manager	2	2	3	2	2	2	3	3	2	2	3	3	3	2	3	3	3
Sub-total – Managerial	3	3	4	3	3	3	4	4	3	3	4	4	4	3	4	4	4
Senior Production Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Production Supervisor	1	1	1	1	1	1	1	2	1	1	1	2	2	1	2	2	2
Senior Foreman	1	2	2	1	1	1	2	2	1	1	2	2	2	2	2	2	2
Foreman	2	3	3	2	2	2	3	3	2	2	3	3	3	3	3	3	4
Fitters	4	5	5	4	4	4	5	6	4	4	5	6	6	5	6	6	6
Electrician	3	2	3	2	2	3	3	3	2	3	3	3	3	2	3	3	3
Boiler House Mechanic	4	4	6	4	4	4	6	6	4	4	6	6	6	4	6	6	6
Lab Assistant	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
Sub-total – Skilled, Technical	17	19	22	16	16	17	22	24	16	17	22	24	24	19	24	25	26
Senior Clerk	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Typist-Clerk	1	1	1	1	1	1	1	2	1	1	1	2	2	1	2	2	2
Storekeeper	1	2	2	1	1	1	2	2	1	1	2	2	2	2	2	3	3
Sub-total – Clerical	3	4	4	3	3	3	4	5	3	3	4	5	5	4	5	6	6
Watchman	3	3	3	3	3	3	3	6	3	3	3	6	6	3	6	6	6
Unskilled Labour	69	56	80	40	40	69	80	112	40	60	80	70	112	56	112	80	120
Sub-total – Unskilled	72	59	83	43	43	72	83	118	43	63	83	76	118	59	118	86	126
TOTAL	95	85	113	65	65	95	113	151	65	86	113	109	151	85	151	121	162

Table 10.9b Trengganu Tengah: Manpower Requirements for Palm Oil Mills

Mill No.	V					VI							VII			VIII		IX				
Year	1981	1982	1983	1984	1985	1980	1981	1982	1983	1984	1985	1977	1979	1981	1983	1976	1978	1980	1987	1988	1989	1990
Capacity tons/hr. ffb.	20	30	40	60	60	20	20	20	40	60	60	20	40	60	60	10	10	10	10	20	20	30
No. of shifts	2	2	2	2	3	1	2	3	3	2	3	2	3	2	3	1	2	3	1	1	2	2
Manager	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Assistant Manager	2	2	2	3	3	2	2	2	3	3	3	2	3	3	3	1	1	1	1	2	2	2
Sub-total – Managerial	3	3	3	4	4	3	3	3	4	4	4	3	4	4	4	2	2	2	2	3	3	3
Senior Production Supervisor	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Production Supervisor	1	1	1	2	2	1	1	1	2	2	2	1	2	2	2			1	1	1	1	1
Senior Foreman	1	1	2	2	2	1	1	1	2	2	2	1	2	2	2	1	1	1	1	1	1	1
Foreman	2	2	3	3	3	2	2	2	3	3	3	2	3	3	3			1	1	2	2	2
Fitters	4	4	5	6	6	4	4	4	5	6	6	4	5	6	6	2	2	3	4	4	4	4
Electrician	2	2	2	3	3	2	2	3	3	3	3	2	2	3	3	2	2	2	2	2	2	2
Boiler House Mechanic	4	4	4	6	6	4	4	4	6	6	6	4	4	6	6	2	2	3	4	4	4	4
Laboratory Assistant	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Sub-total–Skilled, Technical	16	16	19	24	24	16	16	17	22	24	24	16	19	24	24	9	9	13	15	16	16	16
Senior Clerk	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Typist-Clerk	1	1	1	2	2	1	1	1	1	2	2	1	1	2	2				1	1	1	1
Storekeeper	1	1	2	2	2	1	1	1	2	2	2	1	2	2	2	1	1	1	1	1	1	1
Sub-total – Clerical	3	3	4	5	5	3	3	3	4	5	5	3	4	5	5	2	2	2	3	3	3	3
Watchman	3	3	3	6	6	3	3	3	3	6	6	3	3	6	6	3	3	3	3	3	3	3
Unskilled Labour	40	49	56	70	112	40	40	60	80	70	112	40	56	70	112	35	50	60	35	40	40	49
Sub-total – Unskilled	43	52	59	76	118	43	43	63	83	76	118	43	59	76	118	38	53	63	38	43	43	52
TOTAL	65	74	85	109	151	65	65	86	113	109	151	65	86	109	151	51	66	80	58	65	65	74

Table 10.10 Trengganu Tengah: Yearly Demand for Managerial and Skilled Personnel for Palm Oil Mills, 1973 – 1990

	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1987	1988	1990 Total
Managerial															
Manager	2			1	1		1	2	1				1		9
Assistant Manager	4	1		1	3		3	4	2	2	1	1	1	1	24
TOTAL	6	1		2	4		4	6	3	2	1	1	2	1	33
Skilled technical															
Senior Production Supervisor	2			1	1		1	2	1				1		9
Production Supervisor	2	1			1		1	3	2		2	2	1		15
Senior Foreman	3			2	1		2	2	1	2	2		1		16
Foreman	5			2	2		3	5	2	2	2		1	1	25
Fitters	9	1		3	4		5	9	5	2	4	2	4		48
Electrican	5	1		2	2		2	4	5	1		1	2		25
Boiler House Mechanic	8	2		2	6		4	9	6	4	2	2	4		49
Lab Assistant	2		1	1	1		1	2	1				1		10
TOTAL	36	5	1	13	18		19	36	23	11	12	7	15	1	197

10.3 Rubber Processing

10.3.1 Location of Factories (Fig. 10.1)

Rubber processing is the only other agro-processing industry initially envisaged in Trengganu Tengah. The Bukit Besi estate will require a plant of 45 tons per day at peak annual production of 13,500 tons of rubber by approximately 1988. The small output (840 tons) of the FELDA Seberang Tayor scheme is processed in Pahang by FELDA and the Jabor Valley estate has its own small factory making Michelin sheet. A further small plant could be located in the south of Trengganu Tengah by MRDC to process Seberang Tayor and smallholder rubber but the Corporation has not yet decided where to locate a further east coast plant. The most likely outcome is that Seberang Tayor rubber will be processed in a plant set up to serve the surrounding rubber estates of 10,000 acres in total which are proposed for development in Trengganu Tengah in the 1980's. On the projected phasing of these estates a factory with an eventual capacity of 25 to 30 tons a day should be set up in 1987 at Community E.

Unlike palm oil mills, rubber factories need not be sited within the production areas they serve since wet rubber if properly handled need not deteriorate in transit. There are obvious advantages in locating plants as near to production areas as possible particularly if high quality rubbers are being produced. However locating a plant at a considerable distance from an estate need not cause any insuperable difficulties. In fact the attractions of readily available power and water and adequate communications in a nearby urban community might provide sufficient incentive for an estate to locate its plant there. It is therefore envisaged that locating rubber factories to accord with industrialisation and urban community policy would occasion fewer problems than for oil palm mills.

10.3.2 Economics of Rubber Processing

Table 10.11 shows the staffing requirements and the capital and operating costs of SMR factories rated at 20 tons per hour and 40 tons per hour. It is immediately apparent that the economies of scale are much smaller than with palm oil mills. The unit capital cost of the factory building and equipment falls by less than 20 percent as size of factory doubles from 20 tons per day to 40 tons per day. Labour and management costs fall by approximately 30 percent and material costs are virtually unchanged with a fall of only 4 percent.

The relatively small economies of scale result from the comparative simplicity of rubber processing and the absence of expensive and sophisticated equipment. Each processing line of 10 tons per day capacity is effectively complete in itself. Expansion is achieved by adding more lines. The only savings in unit costs are achieved by more intensive use of the relatively inexpensive office and laboratory facilities.

Table 10.11 SMR Plants: Staffing and Costs

Capacity tons/day	20	40
Staffing		
Managerial and Supervisory Staff	12	21
Unskilled Labour	45	75
Capital Cost ($000)	1,310	2,150
Processing Costs ($ per lb. drc)		
Salaries and Wages	1.75	1.20
Materials	2.80	2.70
Transport and Distribution Costs ($ per ton)		
Labour	66	66
Transport and Storage	39.46	39.46

The returns to rubber processing and the value added are given in Table 10.12 over a period of 20 years. The margins are based on a sale price of 60 cents per lb. drc and a cost price of 52 cents per lb. drc. The output relates to Bukit Besi Estate assuming year 0 is 1977. On the basis of the costs given above the internal rate of return to rubber processing is approximately 18 percent over the 20 year period.

Table 10.12 Cash Flow of 50 Ton per Day Rubber Factory

Year	Revenue	Purchased Materials	Capital Cost	Total Purchased Inputs	Value Added	Salaries + Wages	Cash Flow
				$'000			
0	-		1,310	1,310	– 1,310	23	– 1,333
1	997	943		943	54	46	8
2	2,896	2,730		2,730	166	86	80
3	5,617	5,285	420	5,705	– 88	115	– 203
4	9,053	8,519		8,519	534	186	348
5	11,396	10,725		10,725	671	234	437
6	12,968	12,204	840	13,044	– 76	265	– 341
7	13,889	13,079		13,079	810	285	525
8	14,448	15,595		18,595	853	296	557
9	14,728	13,860		13,860	868	302	566
10	15,086	14,197		14,197	889	309	580
11	15,498	14,583		14,583	915	318	597
12	15,986	15,043		15,043	943	328	615
13	16,538	15,563		15,563	975	339	636
14	16,938	15,939		15,939	999	347	652
15	17,342	16,318		16,318	1,024	354	670
16	17,750	16,703		16,703	1,047	364	683
17	18,206	17,132		17,132	1,074	373	701
18	17,998	16,935		16,935	1,063	369	694
19	17,655	16,613		16,613	1,042	362	680
20	17,195	16,391		16,391	804	351	453
NPV at 10%					3,406		1,410
IRR							18%

10.3.3 Phased Development

It is recommended that two rubber processing factories are established in the region during the planning period. The phased installed capacity of these plants is set out in Table 10.13 together with the initial capital investment and the requirement for skilled and semi-skilled workers up to 1990. The first plant, to serve the Bukit Besi Estate should be sited at Community C. Planning of this will begin in 1976, construction will be carried out during 1977 and production will begin during 1978. Initially two lines will be set up but a further line will be needed in 1981 and two further lines by 1984. This would give a daily processing capacity of 50 tons assuming output of 10 tons per line per day with single shift working. Double shift working would raise output per line to 16 tons per day.

The second plant to process the rubber from the proposed estates in Area 20, 21, and 22 will need to start operating towards the end of 1987. It should be located at Community E. This siting would be ideal for processing output from Area 32 if this is eventually planted with rubber. Initially two lines will be adequate to handle the output from the new rubber estates.

Table 10.13 Trengganu Tengah: Rubber Processing Phased Capacity, 1975 – 1990

Year	Estimated Peak[1] Production Tons drc/Month Location		Estimated Plant Capacity Tons drc/Month Location		Capital Investment $'000	Direct Employment		
	C	E	C	E		Skilled	Unskilled	Total
1975	–	–	–	–	–	–	–	–
1976	–	–	–	–	–	–	–	–
1977	–	–	–	–	1,310	–	–	–
1978	74	–	500[2]	–	–	12	45	57
1979	215	–	500	–	–	12	45	57
1980	418	–	500	–	420	12	45	57
1981	673	–	750[3]	–	–	16	58	74
1982	850	–	1,050[4]	–	–	16	58	74
1983	965	–	1,050	–	840	16	58	74
1984	1,034	–	1,250[5]	–	–	26	90	116
1985	1,073	–	1,250	–	–	26	90	116
1986	1,096	–	1,250	–	1,310	26	90	116
1987	1,122	28	1,250	500[2]	–	38	135	173
1988	1,153	119	1,250	500	–	38	135	173
1989	1,190	274	1,250	500	–	38	135	173
1990	1,231	430	1,250	500	–	38	135	173

(1) Peak monthly production assumed to be 10% of yearly total.

(2) Two lines introduced.

(3) One additional line operating.

(4) Two shift working on 2 lines gives additional 12 tons/day output.

(5) Two additional lines operating – all single shift operation.

10.3.4 Investment Programme

The investment required to set up the two SMR processing plants is indicated in Table 10.13. The total cost estimated includes the construction of factory buildings, services, plant and equipment and also housing for all staff in the nearby towns.

The initial investment in the plant at Community C will be made in 1977. This will cost an estimated $ 1.3 million and will provide adequate facilities to handle production from Bukit Besi Estate until 1981 when a further line will be required costing $ 0.4 million. Further investment is required for the plant at Community E to process production from the new rubber estates. This could be deferred until 1987 if the first year's production from this area is processed by the plant at Community C.

The total investment during the planning period in the two new factories is likely to be approximately $ 3.8 million.

10.4 Timber Processing

10.4.1 Introduction

The estimated output of timber has been detailed in Chapter 9. The revenue generated from harvesting activities has been calculated assuming an average price of $ 90 per ton delivered to mill gate.

This section sets out the additional processing capacity required to deal with the projected output from the area up to 1990. An indication of the investment necessary to set up these mills is included together with a phased programme of development.

10.4.2 Projected Log Availability to 1990

Table 10.14 gives an estimate of the total quantity of logs likely to become available from within Trengganu Tengah in the years up to 1990. Given the capacity of existing sawmills and allowing for the committed development of the Kemaman Complex at Chukai, outside the study area, it is apparent that further processing facilities will be limited to one major, sawmilling plant to serve the Dungun forest area.

The estimated outturn from the Dungun forest reserve area is phased to build up to full production by 1983 as indicated in Table 10.14. Although the proportion of logs from within the area to be processed by the two complexes is initially very small it can be seen that by 1981 this rises to more than 50 percent and ultimately to over 70 percent of total anticipated output.

Table 10.14 Trengganu Tengah: Estimated Log Processing

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
	'000 FD tons[1]															
Total Log Availability	491	580	294	254	224	216	217	212	195	186	175	163	162	164	164	164
Processed by:																
Kemaman Complex	5	10	20	23	24	26	26	26	26	26	26	26	26	26	26	26
'Dungun Complex	–	–	5	10	25	45	88	88	90	90	90	90	90	90	90	90
Other sawmills	150	150	150	151	150	145	103	98	79	70	59	47	46	48	48	48
Log Exports [2]	336	420	119	70	25	–	–	–	–	–	–	–	–	–	–	–
Percentage of output processed in the two complexes	1.0	1.7	8.5	13.0	21.9	32.9	52.5	53.8	59.5	62.4	63.3	71.2	71.6	70.7	70.7	70.7

(1) Log Output estimated at 55 cu. ft. per ton.

(2) Logs exported out of the region for processing elsewhere.

10.4.3 Siting of Facilities (Fig. 10.1)

The forest area allocated to the two wood-based industrial complexes has been described in Chapter 9. In this section further details are given of these complexes.

During the planning period to 1990 it is envisaged that output from Trengganu Tengah will be handled by two complexes in addition to the existing sawmills the majority of which are located outside the area.

In the south, the Kemaman Complex will process the output from an annual cutover area of approximately 2,000 acres. The Consultants understand that irrevocable decisions have already been made to site the sawmill unit outside the study area at Kemaman. This act effectively reduces the potential population of the projected township to be sited at location E (Fig. 12.2)

In the north it is recommended that the processing complex serving the Dungun Forest reserve area is sited at Community C (Fig. 12.2). Although the direct employment effect of this facility is not very large, creating approximately 250 jobs by 1983, the employment effects of allied industries engaged in manufacture would be significant.

10.4.4 Proposed Investment

The investment estimated to be needed in basic processing does not include that required for the Kemaman Complex. This is because the operation is outside the region and benefits flowing from it will not directly affect people living in Trengganu Tengah.

The Consultants' recommendations for investment required to establish the basic sawmill complex at Community C must be qualified pending the outcome of negotiations concerning the proposed Romanian "Durom" complex which relates to the same forest area. As the Consultants have not been given details of the proposals for this scheme they are unable to include this project or make comments upon it in this report.

In the absence of this information the Consultants include proposals for a sawmill complex based on recommendations put forward by FAO.[112] This mill, together with addition and enlargements necessary to process the log throughout estimated in Table 10.15, is suggested as the basic unit from which further processing and manufacturing activities can be developed as experience and skills are gained. The phasing of the investment required for the basic unit is detailed in Column 3 of Table 10.16. The relatively modest capital requirement reflects the simplicity of the facility proposed.

The recommendations put forward in this report thus attach considerable importance to in-built flexibility in the structure plan for forest processing. Importance is however also attached to deriving benefits as quickly as possible and with this in mind the initial investment in the sawmill complex is recommended to be made in 1976 so that limited operation may begin when the all-weather road is opened in 1977.

Table 10.15 Dungun Area Timber Complex – Estimated Log Throughput, 1975 – 1990

Year	Log Intake		Sawmill Capacity	Percentage Utilization of Installed Capacity		Employment		
	Tons	Cubic Feet[1] 000's	Cubic Feet '000's	1 shift	2 shift	Skilled	Unskilled	Total
1975	–	–	–	–	–	–	–	–
1976	–	–	–	–	–	–	–	–
1977	5,000	275	1,500	18	–	18	37	55
1978	10,000	550	1,500	37	–	18	37	55
1979	25,000	1,375	1,500	92	–	18	37	55
1980	45,000	2,475	2,800	165	88	32	89	121
1981	88,000	4,840	5,600	161	86	64	178	242
1982	88,000	4,840	5,600	161	86	64	178	242
1983	90,000	4,950	5,600	165	88	64	178	242
1984	90,000	4,950	5,600	165	88	64	178	242
1985	90,000	4,950	5,600	165	88	64	178	242
1986	90,000	4,950	5,600	165	88	64	178	242
1987	90,000	4,950	5,600	165	88	64	178	242
1988	90,000	4,950	5,600	165	88	64	178	242
1989	90,000	4,950	5,600	165	88	64	178	242
1990	90,000	4,950	5,600	165	88	64	178	242

[1] Conversion assumed to be 55 cubic feet per ton.

Table 10.16 Dungun Timber Complex, Estimated Cash Flow, 1975 – 1990

Year	Gross Revenue	Logs	Capital	Operating Costs	Value Added	Cost of Labour and Management	Cash Flow	Cumulative Total
				$'000				
1975	–	–	–	–	–	–	–	–
1976	–	–	1,600	–	– 1,600	–	– 1,600	– 1,600
1977	532	285	–	359	– 112	269	– 381	– 1,981
1978	1,200	569	1,000	510	– 879	314	– 1,193	– 3,174
1979	4,200	1,423	300	878	1,599	314	1,285	– 1,889
1980	7,830	2,561	2,600	1,688	981	541	440	– 1,449
1981	15,840	4,523	–	3,376	7,941	1,081	6,860	5,411
1982	15,840	4,523	300	3,376	7,641	1,081	6,560	11,971
1983	16,200	4,626	300	3,376	7,898	1,081	6,817	18,788
1984	16,200	4,626	–	3,376	8,198	1,081	7,117	25,905
1985	16,200	4,626	300	3,376	7,898	1,081	6,817	32,722
1986	16,200	4,536	300	3,376	7,988	1,081	6,907	39,629
1987	16,200	4,536	–	3,376	8,288	1,081	7,207	46,836
1988	16,200	4,536	300	3,376	7,988	1,081	6,907	53,743
1989	16,200	4,536	300	3,376	7,988	1,081	6,907	60,650
1990	16,200	4,536	–	3,376	8,288	1,081	7,207	67,857

10.4.5 Economic Evaluation

As indicated in the previous section, analysis of further processing and manufacture has not been undertaken. Additional benefits would however accrue to the region if a pre-fabricated timber housing plant is incorporated in the sawmill complex at Durian Mas. The plant recommended for the Lesong Forest Complex in Pahang was estimated to cost $546,000 in 1972. Allowing for a 30 percent rise in costs since then a similar plant covering an area of some 30,000 sq.ft. would cost approximately $ 700,000 at 1974 prices Not only would such a plant reduce the total cost of housing in the region but ready availability of components would help to ensure that housing completions meet the stipulated plan deadlines.

An estimate of the cash flow from the sawmill complex at Durian Mas is given in Table 10.16. The pricing assumptions are based on conditions ruling during 1973 and 1974 and may prove unrealistic given a substantial change in world prices. The phased investment programme and resultant cash flow do not allow for the implementation of recommendations resulting from the Romanian feasibility study and assume a doubling of sawmill capacity in 1981.

The internal rate of return to this basic complex has been calculated on two bases. On the basis that all timber is bought in at a market price of $90 per ton the rate of return is 34 percent over the fifteen year period. On the basis of a 'cost' price of $56 per ton for logs delivered into the mill the return exceeds 50 percent over the same period. These high returns are sensitive to changes in product prices. If the price of finished timber falls by 20 percent the rate of return falls to 30 percent given an unchanged log cost of $56 per ton and falls below zero if the cost of logs bought in remains unchanged at $90 per ton. This latter situation is admittedly an unlikely event. The total direct employment likely to result from this operation is estimated to be approximately 250 by 1983 excluding any allowance for operation of a pre-fabricated housing plant.

10.5 Footloose Industries

The location of industries which are not tied geographically to a raw material source or a specific market depends on the supply of labour and various services. It is possible for a development authority to encourage the establishment of footloose industries through the creation of industrial zones well-served by roads, power, telecommunications and other services. The industrialist's location decision will be related to transport costs of raw materials and finished products, access to markets and prospective customers, ready supply of trained and untrained personnel, taxation and other financial inducements, suitability of factory buildings and local housing and not least the residential attractions of the locality as a home for senior management.

During the planning period it is difficult to foresee any of these requirements being met in Trengganu Tengah. By 1990, however, it is possible that the existence of trained manpower together with adequate infrastructure and a good communications network might attract footloose industries if supplemented by taxation inducements and possibly subsidies from the Federal authorities.

10.6 The Industrial Development Plan

10.6.1 Phasing of Development

The major industrial investment programme is that in palm oil mills. The commissioning of these plants is phased to coincide with the planned agricultural development as set out in Table 10.6. The proposed siting of mills has been related not only to agricultural requirements but also to the aims of urban development. The rubber processing factories have been sited and phased subject to the same criteria. The timber processing complex has been phased with a greater element of in-built flexibility to allow for the incorporation of necessary alternatives and additions such as the suggested pre-fabricated housing plant.

The phasing of all proposed industrial facilities is given in Table 10.17. An indication of the percentage utilization of plant capacity is also given.

10.6.2 Investment

The capital costs of the various proposals for processing facilities have been itemised in Tables 10.7, 10.13 and 10.16. The total investment costs of these facilities are combined together in Chapter 15 (Table 15.29) to show the total capital investment in industrial plant in Trengganu Tengah up to 1990.

Table 10.17 Trengganu Tengah: Proposed Phasing of Industrial Processing Facilities, 1975 – 1990

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
Oil Palm																
Tons/Day	110	130	150	150	190	230	280	320	390	430	430	430	440	450	450	460
Total installed capacity 000 tons/yr (2 shift)	528	624	720	720	912	1,104	1,344	1,536	1,872	2,064	2,064	2,064	2,112	2,160	2,160	2,208
(3 shift)	600	780	900	900	1,140	1,380	1,680	1,920	2,340	2,580	2,580	2,580	2,640	2,700	2,700	2,700
Total Production 000 tons/year ffb	315	353	379	415	471	576	721	888	1,054	1,172	1,238	1,258	1,261	1,270	1,286	1,297
Percentage (whole year (2 shift))	60	57	53	58	52	52	54	58	56	57	60	61	60	59	60	59
Utilization of total capacity peak month (3 shift)	95	82	76	83	74	75	77	83	81	82	86	88	86	85	86	85
Rubber[1]																
Total installed tons drc/month capacity				500	500	500	750	1,050	1,050	1,250	1,250	1,250	1,750	1,750	1,750	1,750
Peak monthly production (tons drc)	–	–	–	74	215	418	673	850	965	1,034	1,073	1,096	1,150	1,272	1,464	1,661
Percentage utilization of plant (peak month)				15	43	84	90	81	92	83	86	88	66	73	84	95
Timber																
Total capacity of Dungun plant ('000 cu. ft./year)	–	–	1,500	1,500	1,500	2,800	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600	5,600
Total log intake ('000 cu. ft./year)	–	–	275	550	1,375	2,475	4,840	4,840	4,950	4,950	4,950	4,950	4,950	4,950	4,950	4,950
Percentage Utilization	–	–	18	37	92	88	86	86	88	88	88	88	88	88	88	88

(1) See Table 10.13.

10.6.3 Employment

The employment directly generated by the processing activities is set out in Table 10.18. The demand for labour is estimated separately for managerial, skilled and unskilled workers. The managerial requirement is fairly low in absolute numbers for all primary processing activities. Substantially more skilled personnel are required in palm oil processing than in either rubber processing or sawmilling. It is recommended that the proposed mill operating agency provides training for these personnel in the existing and first stage mills so that supply is adequate from 1980 onwards.

Table 10.18 Trengganu Tengah: Industrial Employment Projections, 1975 – 1990

	1975	1980	1985	1990
Palm Oil Mills				
Managerial	7	23	30	33
Skilled	54	153	218	237
Unskilled	145	460	862	914
Sub-total	206	636	1,110	1,184
Rubber Factories				
Managerial	–	2	3	5
Skilled	–	10	23	33
Unskilled	–	45	90	135
Sub-total	–	57	116	173
Timber Processing				
Managerial	–	9	18	18
Skilled	–	23	46	46
Unskilled	–	89	178	178
Sub-total	–	121	242	242
Total Processing				
Managerial	7	34	51	56
Skilled	54	186	287	316
Unskilled	145	594	1,130	1,227
TOTAL	206	814	1,468	1,599

APPENDIX E

Oil Palm Yield Estimates by Project

APPENDIX E

OIL PALM YIELD ESTIMATES BY PROJECT

Table E.1 Production Estimates for Mill Group[1] I (tons ffb)

Year	FELDA Bukit Bading	FELDA Jerangau	FELDA Jerangau Barat	Total
1973	32,591	39,108		71,699
1974	38,678	52,664		91,342
1975	41,312	55,373		96,685
1976	46,090	58,035		104,125
1977	47,840	59,502	607	107,949
1978	49,487	60,725	4,858	115,070
1979	49,158	58,090	12,707	119,955
1980	49,158	56,680	20,287	126,125
1981	48,560	56,680	30,073	135,313
1982	46,631	55,480	32,841	134,952
1983	45,547	54,575	35,654	135,776
1984	45,547	52,185	35,091	132,823
1985	44,794	50,775	35,091	130,660
1986	43,098	49,960	35,091	128,149
1987	41,169	48,760	35,091	125,020
1988	40,085	47,855	35,091	123,031
1989	40,085	46,899	33,067	120,051
1990	39,332	46,335	33,067	118,734

[1] For details of milling groups see Chapter 10.

Table E.2 Production Estimates for Mill Groups II & III (tons ffb)

	Group II			Group III		
Year	FELDA Rasau Kerteh	FELDA R/Kerteh Extension	Total	RISDA Ulu Paka Estate	OPE – 1	Total
1978	1,500		1,500	900		900
1979	13,500		13,500	8,700		8,700
1980	43,500		43,500	31,500		31,500
1981	81,000	1,500	82,500	66,900	300	67,200
1982	115,500	12,900	128,400	108,900	3,000	111,900
1983	130,500	37,200	167,700	142,500	11,400	153,900
1984	136,500	57,000	193,500	157,500	24,600	182,100
1985	135,000	69,900	204,900	163,500	36,900	200,400
1986	135,000	72,900	207,900	162,000	43,200	205,200
1987	135,000	72,000	207,000	162,000	45,600	207,600
1988	135,000	72,000	207,000	162,000	45,000	207,000
1989	135,000	72,000	207,000	162,000	45,000	207,000
1990	130,000	72,000	202,000	159,000	45,000	204,000

Table E.3 Production Estimates for Mill Group IV (tons ffb)

Year	NADEFINCO Estate	Chenderong Oil Palm	Area 15	Total
1973	86,105	4,050		90,155
1974	154,810	12,600		167,410
1975	190,518	20,700		211,218
1976	212,299	25,650		237,949
1977	221,586	27,450		249,036
1978	225,036	27,000		252,036
1979	224,136	27,000		251,136
1980	224,136	27,000		251,136
1981	224,136	27,000		251,136
1982	217,380	27,000		244,380
1983	210,274	27,000		237,274
1984	205,732	25,500		231,232
1985	202,232	24,000		226,232
1986	199,232	24,000		223,232
1987	192,476	24,000	497	216,973
1988	185,370	24,000	3,974	213,344
1989	180,828	22,500	9,936	213,264
1990	177,328	21,000	12,917	211,245

Table E.4 Production Estimates for Mill Group V (tons ffb)

Year	OPE – 2	OPE – 3	OPE – 4	FELCRA Y.S.	Total
1979	300		300	300	900
1980	3,000	300	3,000	2,700	9,000
1981	11,400	3,000	11,400	8,700	34,500
1982	24,600	11,400	24,600	16,500	77,100
1983	36,900	24,600	36,900	25,500	123,900
1984	43,200	36,900	43,200	32,100	155,400
1985	45,600	43,200	45,600	35,100	169,500
1986	45,000	45,600	45,000	36,300	171,900
1987	45,000	45,000	45,000	36,000	171,000
1988	45,000	45,000	45,000	36,000	171,000
1989	45,000	45,000	45,000	36,000	171,000
1990	45,000	45,000	45,000	36,000	171,000

Table E.5 Production Estimates for Mill Group VI (tons ffb)

Year	OPE – 5	OPE – 6	OPE – 7	Ladang Tenggara	Total
1978				281	281
1979			300	2,589	2,889
1980	300		3,000	8,666	11,966
1981	3,000	300	11,400	17,104	31,804
1982	11,400	3,000	24,600	27,286	66,286
1983	24,600	11,400	36,900	37,468	110,368
1984	36,900	24,600	43,200	47,536	152,236
1985	43,200	36,900	45,600	56,931	182,631
1986	45,600	43,200	45,000	63,683	197,483
1987	45,000	45,600	45,000	66,721	202,321
1988	45,000	45,000	45,000	67,790	202,790
1989	45,000	45,000	45,000	67,509	202,509
1990	45,000	45,000	45,000	66,571	201,571

Table E.6 Production Estimates for Mill Groups VII, VIII & IX
(tons ffb)

	Group VII			Group VIII	Group IX
Year	FELDA Neram I	FELDA Neram II	Total	Jabor Valley Estate	FELDA Pasir Raja
1973				1,900	
1974				3,299	
1975				6,842	
1976	931		931	10,071	
1977	8,258		8,258	13,864	
1978	25,090	1,170	26,260	18,791	
1979	40,375	9,360	49,735	24,622	
1980	49,880	23,400	73,280	29,460	
1981	52,900	30,420	83,320	34,729	
1982	52,182	36,270	88,452	36,168	
1983	52,182	35,100	87,282	37,668	
1984	52,182	35,100	87,282	37,082	
1985	52,182	35,100	87,282	36,456	
1986	52,182	35,100	87,282	36,185	900
1987	52,182	35,100	87,282	35,865	8,100
1988	49,078	35,100	84,178	35,418	26,100
1989	46,384	35,100	81,484	33,930	49,500
1990	46,384	31,200	77,584	33,304	77,800

APPENDIX F

Terms of Reference for Feasibility Studies

APPENDIX F

TERMS OF REFERENCE FOR RECOMMENDED FEASIBILITY STUDIES

F.1 Terms of Reference for a Feasibility Study on Centralised Milling and further Processing of Palm Oil in Trengganu Tengah

General

During the next twelve years (1974 – 1986) the area planted to oil palm in Trengganu Tengah is projected to increase from 50,000 acres to 163,000 acres; Production of ffb from this area is estimated to reach a peak in 1991 of 1.3 million tons (1973 production, 164,000 tons). There are at present two palm oil mills in the area, one owned by FELDA and the other by the private sector. These mills will continue to handle the ffb from their own areas but the new oil palm areas recommended in the Trengganu Tengah Study will have to be served by new mills.

The Consultants for the Trengganu Tengah Study have recommended that a few large mills should be built, each to serve a number of estates or settlement areas and that these mills should be located in or adjacent to the proposed new urban settlements.

The principal objective of the feasibility study is to evaluate this proposal with regard to its economic, operational and social implications.

Objectives

(i) To consider in more detail, the proposal made in the Trengganu Tengah Study, that oil palm processing in the area should be done in central, shared mills rather than in estate based mills. The advantages and disadvantages of the system should be presented and discussed and a positive conclusion drawn.

(ii) If centralised milling is considered to be unworkable, to suggest alternatives and to analyse the consequences. If centralised milling is recommended a detailed study is required of its implications. This should include a financial appraisal in a form suitable for use as a loan application to international lending agencies. The study should include a detailed analysis of the management factors involved in centralised milling including field to mill transport.

(iii) To review the prospects for further processing of oil palm products in the region and to evaluate the benefits of siting refining and manufacturing plants in Trengganu Tengah.

Scope of the Study

(i) The study should examine the advantages and disadvantages of centralised palm oil processing. Some of these have been identified during the Trengganu Tengah Study but the list is not exhaustive :-

Advantages

(a) Lower capital cost per unit of milling capacity.

(b) Better use of peak capacity.

(c) Greater flexibility of estate size.

(d) Better availability of processing facilities to smallholder growers.

(e) The creation of an industrial base in the proposed settlement centres.

(f) A supply of surplus electrical power to the settlement centres.

(g) Centralised pollution control.

(h) Better prospects for further processing (e.g. refining).

Disadvantages

(a) Possible increase in transport costs from field to mill.

(b) Difficulty in organising several suppliers of ffb to coordinate with the mill throughput.

(c) Difficulties in maintaining quality of the palm oil when ffb is brought from a widespread area.

(d) Greater risk of losses from stoppage due to breakdown or industrial strife.

These and other aspects should be examined and evaluated and definite conclusions drawn as to their validity.

(ii) If the centralised milling concept is considered a practical proposition, a working plan should be drawn up to cover the following points :-

(a) The phasing of building and capacity of each mill.

(b) Financing, including sources of finance and participation of public and private sectors. A financial plan should be prepared for one or more of the mills suitable for submission as a loan application to international lending agencies.

(c) Ownership pattern; it is suggested that a central organisation should have a controlling share in a number of the mills. The role of LKTT in this respect should be examined.

(d) A study should be made of the management problems likely to be encountered and the following aspects should be included :-

Mill to field communications to ensure a smooth flow of ffb to the mill.

Problem of maintaining quality of oil when taking ffb from a number of estates/schemes.

Transport from field to mill. The latest methods should be discussed and costs should be presented to show the increased transport cost (if any) incurred by central mills as opposed to estate based mills.

The possibility of introducing larger vehicles than those presently used (about 5 tons capacity) should be discussed in the view of the all-weather road network proposed for Trengganu Tengah.

(e) The necessary inputs of manpower for each new mill should be determined and the need for training of managerial and skilled personnel should be estimated.

(f) If centralised milling is not considered workable, alternatives should be suggested such as the building of small mills to serve each estate which would be located either on each estate or in industrial sites in the new urban communities.

(iii) (a) The prospects for further processing (e.g. kernel oil extraction, palm oil refining) should be examined. The role of centralised mills in facilitating the organisation of further processing should be evaluated.

(b) The phasing, financing and location of further processing units should be determined.

(c) Methods should be suggested whereby the greatest possible proportion of profit from processing would be redistributed to the primary producer.

Sources of Information

The principal source of information on Trengganu Tengah will be the Trengganu Tengah Regional Planning and Development Study. It may also be useful to draw on the Feasibility Study for the Jerangau-Jabor Road (Ove Arup & Partners) with reference to road specifications and recommendations on vehicle weight and loading.

Inputs Required

The study will require the services of a Palm Oil Processing Engineer with extensive planning experience. He should be the team leader. An Economist will also be required and possibly a Transport Specialist with experience in the transportation of bulk raw materials (such as ffb) from field to factory. The mill specialist and the economist should provide four month inputs to run concurrently. The transport specialist should contribute a one month input in the second month of the study.

Since oil palm is the major crop in Trengganu Tengah and the concept of centralised processing is considered vital to the effective development of the region it is strongly recommended that this feasibility study be started at once. The team need not be based in Trengganu but should make visits especially during the monsoon season when ffb production reaches its peak and transport problems are most acute.

F.2 Terms of Reference for a Feasibility Study on the Production and Supply of Fresh Vegetables and Fruit to the Urban Area of Kuantan, Pahang.

General

The town of Kuantan, Pahang is rapidly expanding to become the principal centre of urban growth on the East Coast of Peninsular Malaysia. This process will be accelerated by the development of the Pahang Tenggara area, the building of a port at Tanjong Gelang and the concentration of industrial development on sites adjacent to the town and the port. Over the next twenty years a considerable increase in the demand for fresh vegetables and fruit is foreseen and if this is to be supplied at reasonable prices it should be produced locally. The southern tip of the Trengganu Tengah Development Area is within ten miles of Kuantan town and the new port area. An area has been identified which contains about 1,000 acres of Class 1 soils and 2,000 acres of Class 2 soils which are considered suitable for the growing of vegetables and fruits, and the object of the study should be to assess whether this land (identified as Development Area 30 in the Trengganu Tengah Study) has the potential to supply the developing markets adjacent to it with fresh market garden produce.

Objectives

The study should have three main objectives:—

(1) To make a survey of the present and future demand for fresh vegetables and fruit in the town of Kuantan and its environs.

(2) To make a survey of the agronomic and economic factors involved in the production of vegetables and fruits on the area suggested in Trengganu Tengah.

(3) To outline a suitable programme for an initial pilot project in the area and suggest how the future development of the area might be carried out to ensure the regular and efficient production and marketing of the produce while at the same time satisfying the socio-economic objectives of the NEP.

Scope of the Study

In more detail it is foreseen that the study should include the following topics:—

(1) (a) Survey of existing population, per capita disposable income and consumption function. Determination of present consumption by quantity and type of produce.

(b) Estimation of growth in population and per capita disposable income. Derive projected demand for produce.

(c) Survey of present sources of supply of fresh produce including quantitites and prices. Identify seasonal fluctuations in supply and prices and the reasons for them.

(2) (a) Survey of present range of produce grown in the area and the quantities presently reaching nearby markets and estimate demand for additional supply of produce.

(b) Review of technical information available on the growing of vegetables and fruits in Malaysia as a whole and in the region in particular. Likely constraints to production including seasonal fluctuation. A review of the need for soil conservation measures and the possible need for irrigation.

(c) Preparation of budgets for each major crop proposed.

(d) Investigation of the possibility of processing the produce surplus to immediate local demand.

(3) (a) Pilot project plan to include detailed statement of crops to be grown, research objectives and inputs needed including financial, physical and manpower.

(b) Selection of a suitable agency to initiate the pilot project and implement commercial development in the future. The Government agency, FIMA is suggested as being suitable for both these tasks.

(c) An investigation of the feasibility of smallholders taking the major role in production with a nucleus estate to supply some production, planting material, extension and credit and to handle quality control and the marketing of produce. Such questions as holding size, suitable cropping pattern and farm budgets should be covered.

Sources of Information

The report of the Kuantan Town Study will provide the demographic base. It will be necessary to collect information in the field to determine supply and demand trends and price levels. Information on the present status of local production can to some extent be obtained from the Agricultural Department and other agencies such as FAMA. Some field work may be necessary to supplement this information.

The agronomic and economic information can be largely obtained from existing literature. Before the Study commences, there should be a detailed soil survey of the proposed project area. From this, location of suitable areas for each type of crop can be determined.

The determination of a suitable project organisation and management system will have to be made drawing on the experience of similar schemes elsewhere in Malaysia and neighbouring countries.

Input Required

The study will require an Agricultural Economist who should also be the team leader, a Vegetable and Fruit Production Specialist and a Marketing Specialist. For the market and consumer studies some input is needed for field survey personnel and it is suggested that economics or sociology students from the universities might be interested in participating in this aspect as part of their field training. The study proposed would take a minimum of three months to complete with the three principal inputs being present for the whole period. The study team should be based in Kuantan. They could start work as soon as the soil survey of the area is completed and published.

F.3 Terms of Reference for a Feasibility Study of a Unit to Farm High Priced Aquatic Species

General

Freshwater fish farming has been practised for several decades in Malaysia. However the practice has rarely progressed beyond a smallholder operation, and freshwater fish farms have not in general proved attractive to large scale investors. Some reasons for the previous slow development of fish pond units could be the high capital cost of pond preparation, the low price of fish produced and the complex technical problems involved.

In order to give adequate rates of return it is believed that aquaculture units should specialise in the production of high priced aquatic species for the luxury market. This has in general proved to be responsible for the small but increasing number of aquaculture units in other countries. The management techniques involved can be very complex, for aquaculture units are prone to all the problems liable to affect any intensive animal production unit, and the closest attention should be given to the choice of a high calibre manager.

Objectives of the Feasibility Study:

(a) To assess the present knowledge available on farming such species as freshwater prawn, freshwater turtles, frogs and aruan.

(b) To check availability of supply of the fry and juveniles.

(c) To assess probable mortality rates during farm operation.

(d) To check growth rates, and food conversion ratios.

(e) To assess the optimum harvesting time, in relation to price, ground conditions (e.g. monsoon flooding), and other considerations.

(f) To assess the possibility of engaging a competent manager to supervise the project.

(g) To recommend a suitable location.

(h) To undertake a financial evaluation of the project.

Scope of the Feasibility Study:

The study should include collection of data gathered by research workers not only in Malaysia but throughout Asia and tropical countries.

Within Trengganu Tengah particular attention should be paid to the effect of the monsoon rains, and to problems of transport and their effect on costs.

Further attention should be given to the rate of return and employment resulting. It is probable that employment will be low, whereas initial capital cost will be high. The value added per worker should however be very high.

It is possible that the study will reveal so many variables that the farming of higher priced species should not immediately be entertained. It may therefore emerge as the best policy to farm the lower priced fish for the first two years, and then to move gradually into farming the luxury species as some of the technical skills and techniques are gradually acquired.

Input Required

A Fisheries Planner in association with an Economist would be required to work closely on this project for at least 3 months. An Engineer may be required to assist in design of the bunds.

This study is suitable for either public or private sector investors and it should be brought to the attention of interested parties.

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