THE GOVERNMENT OF MALAYSIA
LEMBAGA KEMAJUAN TRENGGANU TENGAH

TRENGGANU TENGAH

REGIONAL PLANNING AND DEVELOPMENT STUDY

VOLUME IV
MANPOWER, INFRASTRUCTURE, IMPLEMENTATION & EVALUATION

HUNTING TECHNICAL SERVICES LIMITED
with
Shankland Cox Partnership

NOVEMBER 1974

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FINAL REPORT

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CHAPTER 11

Population, Migration and Training

11. POPULATION, MIGRATION AND TRAINING

11.1 Employment Projections

Table 11.1 shows the level of employment in Trengganu Tengah in 1970 broken down by sector. This breakdown is based on the 1970 census in rural areas of Dungun and Kemaman Districts, as used in Appendix C (Tables C.13 and C.14). In Table 11.1 certain adjustments are made to the census-based figures, mainly to account for the geographical situation of Trengganu Tengah, which does not touch the coastal strip. Thus the industrial breakdown for Dungun and Kemaman Districts is likely to have overestimated the number of people employed in non-primary industries in Trengganu Tengah and to have underestimated those employed in small-scale agriculture.

Estimates of future employment opportunities in Trengganu Tengah are shown in Table 11.2. The projections of employment in agricultural production and processing and in forestry are based on the development plans outlined for these sectors in Chapters 8, 9 and 10. As can be seen, agriculture will be by far the largest employer of labour, with forestry development making only a marginal impact. Employment in the third primary sector, mining, is expected to remain approximately constant at the 1970 level net of Bukit Besi. This allows for new small mines and gravel pits to replace those gradually being worked out, but data on this sector is extremely scanty.

In order to estimate future non-primary employment in Trengganu Tengah a ratio of primary to non-primary employment has been used. This seems to be the most appropriate method for what is essentially an agricultural development region. In fact the ratio which existed in Trengganu Tengah in 1970 is close to the ratio of 3:2 which was utilised in the Pahang Tenggara Regional Planning Study and the use of this ratio therefore seems quite appropriate for the present study. The projection of small-scale farmers has been based upon the population projection B for the region which is shown in Chapter 3; but whether or not they will remain in small-scale farming is a different question, which will be further discussed below.

According to the plan proposed for the region, the total estate and settler labour force (including processing of products) is expected to increase from 1,950 persons (estimated for 1970) to 11,600 in 1980 and 18,900 in 1990. The demand for labour in forestry is largely associated with exploitation of the new areas coming under agricultural development. By comparison its demand for labour is small, rising from 320 in 1970 to 900 in 1980 and 1,000 in 1990. Employment in mining will remain unchanged over the period, and small-scale farming will show a marginal increase. Overall, the level of employment in Trengganu Tengah is expected to more than double itself between 1975 and 1990, rising from 15,050 to 38,750.

Table 11.1 Trengganu Tengah: Employment by Sector, 1970

	Male	Female	Total
Primary Sector			
Oil palm	1,000	300	1,300
Rubber estates	455	195	650
Total estate workers	1,455	495	1,950
Forestry	320	0	320
Mining, net of Bukit Besi migrants (1)	505	0	505
Total primary excl. small farmers	2,280	495	2,775
Non-Primary Sector			
Manufacturing	370	130	500
Construction	140	–	140
Utilities	20	–	20
Commerce	450	210	660
Transport	810	220	1,030
Sub-total	1,790	560	2,350
Less 20% (2)	360	110	470
Total non-primary	1,430	450	1,880
Small scale farmers			
Rubber (3)	1,555	675	2,230
Padi	860	730	1,590
Fishing	670	–	670
Contractor labour	150	40	190
Other	240	120	370
Transfer from non-primary (3)	360	110	470
Total small scale farmers	3,835	1,675	5,510
Total Employed (4)	7,545	2,620	10,165
of whom: own account (5)	2,880	750	3,630
Family workers (5)	460	890	1,350

(1) See Appendix C

(2) See text: 20% of non-primary transferred to "small farmers."

(3) Residue of those employed in rubber less those employed in Jabor Valley estate and FELDA scheme.

(4) Equal to the "total employed" figure in Appendix Table C.13 and C.14, less the 955 emigrants from Bukit Besi

(5) See Appendix Table C.12

Sources: Appendix Tables C.13 and C.14 – 1970 Census Data.

Table 11.2 Trengganu Tengah: Employment Projections, 1970 — 1990

	1970	1975	1980	1985	1990
Agricultural production and processing (1)					
Settlers	n.a.	1,450	3,950	4,450	5,400
Unskilled workers	n.a.	2,850	6,900	10,200	12,450
Clerical/Supervisory/Skilled	n.a.	300	600	800	900
Managerial	n.a.	50	150	150	150
Total production and processing excluding contract labour	1,950	4,650	11,600	15,600	18,900
Forestry production and processing (2)	320	500	900	1,000	1,000
Mining (3)	1,460	500	500	500	500
Sub-total: primary	3,730	5,650	13,000	17,100	20,400
Sub-total: non-primary (4)	1,880	3,750	8,650	11,400	13,600
Sub-total: small scale farmers	5,510	5,650	5,800	5,950	6,150
Total direct labour	11,120	15,050	27,450	34,450	40,150
Contract labour (1)	190	4,800	1,950	1,650	100

(1) Estimate from phased development of agriculture projects.

(2) Estimate from phased development of forestry projects.

(3) This is the 1970 figure net of Bukit Besi migrants from Table 3.1 carried forward. Little information is available on likely mining development; it is assumed that new mines, gravel pits, quarries etc. will be started as old ones are worked out.

(4) This is based on the ratio primary to non-primary = 3:2, which is the ratio taken from Table 3.1. It also agrees with that used in the neighbouring Pahang Tenggara Study (see Pahang Tenggara Regional Masterplanning Study, Working Paper No. 51 Appendices, Section 6.0, p. 30).

11.2 Employment and Labour Force

Table 11.3 compares the employment projections from Table 11.2 with the labour force projections resulting from natural population growth given in Chapter 3, Table 3.15. Clearly, employment is projected to grow very much faster than the natural increase in the labour force, even when the latter is derived from quite high participation rates (see Chapter 3, Section 3.9). There is no chance of this quantity of labour being supplied from within the study area, even in the unlikely event of all the smallholder farmers choosing to move on to the new estates. A very considerable volume of migration from elsewhere is required if the projected development of Trengganu Tengah is to proceed as planned.

Not only is it unlikely that by 1990 all potential smallholders in the study area will have moved onto the estates, it would also be undesirable, since this would leave the area in an imbalanced state, with no small-scale agricultural activities and permanent importation of most of the region's basic food requirements. However, it is reasonable to suppose that by 1990 some of the present number of small-scale farmers will have elected to move on to the estates. It is obviously not possible to forecast such a move with any precision, but assumptions have been made, as described below.

It has been assumed that by 1975, 1,500 of the 5,100 contract labour requirements will be supplied by small-scale farmers who temporarily decide to do this kind of work; this is just over a quarter of the small-scale farmers of the region. This figure of 1,500 is not likely to be exceeded, even in the peak period between 1975 and 1980, and the balance must come from outside the region. It is likely that some of the local small-scale farmers will decide, having worked as contract labourers, to stay on the estates. Accordingly, it has been assumed that by 1980, 500 will have so moved, by 1985 a further 1,000 will have so moved, and another 500 by 1990. This means that the number of small-scale farmers will be only 4,150 in 1990 as against the original projection of 6,150. It also means that, by 1990, 2,000 fewer persons will be required to migrate into the region from elsewhere. The new excess of employment over labour force, which implies the amount of immigrant labour required, is shown in the final line of Table 11.3. The required number of immigrants reaches a peak between 1975 and 1980, when employment is expected to almost double. Between 1980 and 1985 a further increase of 25 percent in employment is expected, but after 1985 the need for migrants will diminish sharply as natural increases in the labour force more nearly balance increases in labour demand.

Table 11.3 Trengganu Tengah: Employment and the Labour Force

	1970	1975	1980	1985	1990
Labour force (1, 3)	12,500	12,250	13,900	15,800	17,850
Employment (2, 3) (excl. contract labour)	11,120	15,050	27,450	34,450	40,150
Revised employment projection(4)	11,120	15,050	26,950	32,950	38,150
Excess employment over labour force	−1,380(5)	2,800	13,050	17,150	20,300

Quinquennial Changes	1970–75	1975–80	1980–85	1985–90
Labour force	− 250	+ 1,650	+ 1,900	+ 2,050
Percent	− 2.0	+ 13.5	+ 13.9	+ 13.1
Employment (excl. contract labour)	+ 3,930	+ 12,400	+ 7,000	+ 5,700
Percent	+ 35.3	+ 82.4	+ 25.5	+ 16.6
Required number of migrant workers	3,770	10,250	4,100	3,150

(1) Table 3.15

(2) Table 11.2

(3) The difference between labour force and employment in 1970 is partially explained by the existence of an estimated 510 unemployed persons (see Appendix Table C.13). It is due to the calculation of the labour force by means of participation rates from Table 3.14 rather than taking the census figure.

(4) The adjustment is made to allow for an assumed movement of small farmers onto the estates, as described in the text.

(5) In 1970 there was an apparent surplus of labour over employment.

11.3 The Supply of Migrants

The most obvious source of migrants into the study area is Trengganu State itself. In order to estimate the number of potential migrants within the State, the 1970 state population (adjusted for under-enumeration) is projected in Table 11.4 by five yearly intervals to 1990. The resultant projections are somewhat higher than those in the NEDECO report,[8] largely because the latter under-estimated the 1970 population by 20,000. By 1980 the NEDECO medium projection indicates a population of 530,700, rising to 700,000 by 1990, which is 5 percent less than the total in Table 11.4.

Table 11.5 gives a projection of the labour force of Trengganu State, based upon the five or ten year age groups which make up the projected population in Table 11.4 and the participation rates in Table 3.14. As was the case with Trengganu Tengah, two sets of female rates were used and an average total has been taken; reasons for this are discussed in Chapter 3. The total labour force is estimated to increase from 152,700 in 1970 to 199,300 in 1980 and to 263,400 in 1990, an increase of 72.5 percent in twenty years.

Table 11.4 Population Projection[1] of Trengganu State

	1970	1975	1980	1985	1990
Male					
0 – 14	96,000	104,800	116,000	133,800	152,600
15 – 39	72,100	90,100	108,400	127,700	147,700
40 – 64	34,000	35,700	41,300	46,400	52,700
Over 64	7,400	9,400	10,700	12,800	14,400
TOTAL	209,600	239,900	276,400	320,700	367,400
Female					
0 – 14	94,700	102,600	113,200	130,300	148,600
15 – 39	73,800	91,900	108,800	127,600	147,300
40 – 64	36,000	38,100	45,600	50,600	55,600
Over 64	6,900	9,400	10,800	13,900	17,100
TOTAL	211,400	241,900	278,500	322,400	368,600
Total					
0 – 14	190,800	207,400	229,200	264,100	301,200
15 – 39	145,900	182,000	217,200	255,300	295,000
40 – 64	70,000	73,700	86,900	97,100	108,300
Over 64	14,300	18,700	21,500	26,700	31,500
TOTAL	420,900	481,800	554,800	643,200	735,900

(1) The method of projection is identical to that used for the population projections of Trengganu Tengah and described in Chapter 3.

Table 11.5 Trengganu Tengah: Labour Force Projection[1]

	1970	1975	1980	1985	1990	% Increase 1970–90
Male						
15 – 29	42,700	52,000	64,100	75,000	81,700	91.3
30 – 64	56,800	60,800	65,900	75,200	91,300	60.7
TOTALS	99,500	112,800	129,900	150,200	173,000	73.9
Female (average)						
15 – 29	20,600	25,200	30,500	34,400	36,900	79.1
30 – 64	32,600	35,500	38,900	44,800	53,500	54.1
TOTALS	53,200	60,700	69,300	79,200	90,400	69.9
Total						
15 – 29	63,300	77,200	94,500	109,400	118,600	87.4
30 – 64	89,400	96,400	104,700	120,000	144,800	62.0
TOTALS	152,700	173,500	199,300	229,400	263,400	72.5

(1) The method used is identical to that described in Chapter 3. No allowance has been made for movement of Bukit Besi labour force outside the State; the resultant change on the State position would be insignificant.

Table 11.6 gives the projected employment of Trengganu State up to 1990. The source is the NEDECO report, which is the most up-to-date set of projections for the State as a whole. No attempt has been made to revise these figures. The table indicates an increase in total employment within the State from 135,500 to 216,800, an increase of 81,300 or 60 percent in twenty years. The final line in Table 11.6 is an amendment which has been made to the NEDECO projections to take account of the extra employment likely to be generated in the State as a result of the Trengganu Tengah study area. The derivation of the new employment figure is explained in Table 11.7.

Table 11.6 Trengganu Tengah: Employment Projections

	1970	1975	1980	1985	1990
Crops and livestock	72,200	80,200	89,900	100,000	106,000
Fisheries	9,800	9,000	8,400	7,600	6,800
Forestry	700	800	900	1,100	1,300
Sub-total agriculture	82,700	90,000	99,200	108,700	114,100
Mining(1)	2,100	2,200	2,200	2,400	2,700
Manufacturing (a) agricultural processing	1,000	1,500	2,100	2,800	3,300
(b) other	9,000	10,700	12,600	14,700	17,200
Construction	3,800	4,300	4,600	4,900	6,300
Sub-total: Mining, manufacturing, construction	15,900	18,700	21,500	24,800	29,500
Communication, transport, trade, tourism and other services	29,900	36,600	43,600	50,100	58,600
Public administration, defence, health and education	7,000	8,400	9,900	11,800	14,600
Sub-total: Services	36,900	45,000	53,500	61,900	73,200
Total employment	135,500	153,700	174,200	195,400	216,800
Total employment(2) (amended)	135,500	162,100	184,700	215,400	237,800

(1) This does not account for the closure of the Bukit Besi mine, some of whose employees may have left the State. However, this loss may have been compensated for by the increase in offshore oil drilling.

(2) The amended total employment in 1990 has been calculated by estimating the additional employment created in Trengganu Tengah over and above that estimated in the NEDECO Report. The method used is shown in Table 11.7

Source: NEDECO Report.[8]
Vol. 1, Table VI – 3.
Vol. 3, Annex V. B, p. 5.
Vol. 4, Annex X, Tables 2 – 3 and 2 – 4.

Table 11.7 Trengganu Tengah: Calculation of Additional Employment

	NEDECO Agricultural Acreage in 1990	Present Study	Increase	Additional Employment in 1990
Oil palm	104,000	216,000	112,000	8,000
Rubber	10,000	40,500	30,500	3,500
Padi	8,000	–	– 8,000	–1,200
Other crops	–	30,500	30,500	2,300
Increase in primary employment				12,600
Non-primary employment (ratio 2:3)				8,400
Total additional employment				21,000

In Table 11.8 the surplus of the labour force over employment opportunities in Trengganu State is shown, first for the whole of the State and secondly for the State excluding Trengganu Tengah. Except in 1970, there is always a surplus of jobs inside the study area and always a surplus of labour in the State as a whole. Thus the surplus of labour in the State excluding the study area is greater than that in the State as a whole. It can be seen quite clearly in Table 11.8 that there will be a substantially larger supply of potential migrants within the State than there will be demand for migrants within the study area. For example, in 1975 the estimated number of potential migrants (i.e. apparently unemployed) outside Trengganu Tengah will be five times the estimated number of jobs available for the non-resident labour force. By 1985 the ratio will have fallen to slightly less than 2:1, but subsequently, it will rise again fairly sharply. Throughout the period from 1975 the absolute number of unemployed outside the study area will be increasing steadily, and assuming a 100 percent success in encouraging migrants into Trengganu Tengah to fill all the available jobs, there will still be substantial surpluses of labour within the State as a whole throughout the 20 year period.

Table 11.8 Trengganu Tengah: Employment and Labour Force Projections

	1970	1975	1980	1985	1990
Trengganu State					
Labour force	152,700	173,500	199,300	229,400	263,400
Employment	135,500	162,100	184,700	215,400	237,800
Surplus labour	17,200	11,400	14,600	14,000	25,600
Trengganu Tengah					
Surplus jobs (1)	−1,380 (2)	2,800	13,050	17,150	20,300
Trengganu State outside Trengganu Tengah Surplus labour	15,820	14,200	27,650	31,150	45,900
		1970–75	**1975–80**	**1980–85**	**1985–90**
Quinquenial increase in surplus labour		− 1,620	13,450	3,500	14,750

(1) From Table 11.3. Does not account for contract labour.

(2) In 1970 there was an apparent surplus of labour over jobs.

It is important to point out that the margins of error implicit in these calculations are inevitably wide. Although the numbers of unemployed within the State will remain fairly high (ranging between 5 and 10 percent of the labour force), it should be remembered that the labour force has been calculated on a basis which reflects a willingness to work but not necessarily an absolute need to work or, more importantly, a willingness to migrate to find work. Thus, the problems of obtaining an adequate labour supply of acceptable quality within the study area should not in any way be underestimated. This is particularly so when it comes to skilled labour and managerial personnel. Nevertheless, it is clear that potentially the great majority of the benefits, in terms of new employment opportunities, could go to people from within the State of Trengganu and that, given adequate incentives within Trengganu Tengah, a sufficient supply of labour should be available for the proposed developments.

11.4 Problems of Migration

The calculations of potential migrants within the State imply a tacit assumption that such persons will be willing to move and, furthermore, that they will be willing to move to Trengganu Tengah. This is a sociological question, and as such cannot be answered merely by a quantitative analysis such as that contained in this chapter.

Ultimately, more information will become available from the 1970 population census which will include special cross-tabulations of migrants by occupation, industry, educational level, marital status, family status, by previous place of residence and length of stay in the community. It is recommended that when this data becomes available it should be carefully scrutinised, for Dungun and Kemaman Districts in particular, to give further information on the kind of person who migrates in this part of the country.

A further aspect of migration, which will not be answered by such an analysis, is people's motivations towards migration, leading to a clearer understanding of why people change their occupations and of what incentives and amenities are necessary to induce them to migrate. This kind of information can only be obtained from a detailed sociological survey, which it is understood is being considered by the mobile team of the Department of Town and Country Planning.

There seem to be two principal problems regarding migration. The first is the change in occupation and area of residence. The persons identified in Table 11.8 as potential migrants will be moving from one particular occupation and way of life to another, from one area to another. A particular case in point involves the fishermen along the coast of Trengganu, who,it has been suggested, may prove likely potential migrants to the region. The reasons for this are that there are considered to be too many fishermen for the average catch to rise above a fairly low level, given the generally poor techniques of fishing currently being utilised. In addition, there are plans by the Department of Fisheries to modernise the industry along the East Coast by the introduction of deep-sea trawling. Whilst it is still too early to say to what extent these plans will form part of the Third Malaysia Plan, the present indications are that they will be incorporated at least in part.

It is not clear yet how far these plans will affect the present employment of inshore fishermen. Certainly opportunities will be created on the new trawlers and in the fish processing plants, but this will probably result in a reduction of inshore fishermen. There are other developments also taking place, such as the possible future development of ferro-concrete boats to replace the traditional wood variety, which may also have certain implications for employment in the fishing industry. The NEDECO employment projections used in Table 11.6 envisage a reduction in the number of fishermen from 9,800 in 1970 to 6,800 in 1990. However, the total number of migrants required for the study area between 1970 and 1990 is some 20,000, which far exceeds the number of fishermen in 1970. The fishing industry may be able to supply some of the migrants for Trengganu Tengah, but it certainly will not supply the majority.

In the past there has been some success in relocating fishermen from the coastal areas on settlement schemes inland. The FELDA schemes north of Trengganu Tengah and within the area contained a number of former fishermen who have been satisfactorily settled and are now better off than they were before. It, therefore, seems likely that more people of this kind will be interested in moving to settlement schemes in Trengganu Tengah. Whether they will be as willing to work as daily paid labour on the new estates is as yet unknown, but there are some indications that work of this nature may not satisfy their aspirations. At present, little work of a sociological nature has been done on this subject and a study of some kind is clearly called for in the near future.

Some indications of the most likely source of migrants can be obtained by looking at the percentage increases of the labour force by sex and major age-group in Table 11.5. It is clear that the largest increase is expected to take place amongst the younger segment of the labour force, due to the relatively high birth rate which is expected to continue for some time yet. This is particularly so in the case of males, but the female percentage is also much higher than the average. Overall, the 15 – 29 segment is expected to increase by 87 percent, as compared to 62 percent for the 30 – 64 segment and 72.5 percent for the whole labour force.

This indicates that the bulk of the potential migration supply is likely to come from amongst the young, probably from school leavers. Such persons will otherwise form a growing number of unemployed youth, probably largely concentrated in urban and peri-urban areas. This has already begun to be a feature of Malaysia's economic life.[5] It should be noted that the requirements for FELDA settlers which include a family plus some agricultural experience plus other requirements which are combined in an overall rating system, may tend to mitigate against such persons. However, this problem is being tackled through the Youth Scheme programme of FELCRA. There is one such scheme already planned for Trengganu Tengah at Ulu Chukai which will provide oil palm smallholdings for 400 youths. If this project is successful consideration should be given to allocating further areas for Youth Schemes in Trengganu Tengah.

There are some encouraging features concerning migration which should be mentioned. The analysis of migration trends in Chapter 3 indicated that 80 percent of the migrants enumerated within the districts of Dungun and Kemaman had come from within the State. Intra-state is far more important than inter-state migration, at any rate in this part of Malaysia. The people of Trengganu are clearly a mobile people and, hopefully, this will be apparent in the future as labour in Trengganu Tengah is required.

Secondly, it should be noted that, for the districts of Dungun and Kemaman, the volume of rural-rural migratory moves was high, and urban-rural exceeded rural-urban migration,contrary to national trends. This, too, is encouraging since Trengganu Tengah is at present a rural area, even though the planned settlement pattern will introduce important urban areas. Whether such a trend is equally apparent among, say, fishermen or the young cannot be ascertained without further data, but the indications at any rate are encouraging.

All the indications are that migration in the past has been largely concentrated amongst young adults, especially males. For non-Malays the concentration is even greater amongst males, but appears to be less con centrated amongst those aged under 30 than is the case with males as a whole. However, non-Malays appear to migrate less frequently to rural areas, and are to be found less frequently in the agricultural occupations (except rubber tapping) which form the bulk of the new job opportunities.

The second major problem of migration is whether Trengganu Tengah is likely to be a first choice destination of persons wishing to migrate. Table 3.8 indicates that Trengganu has in the past been a net gainer from inter-state migration, but in this instance it may be unwise to rely too much on past trends. In the next twenty years rapid development is expected to take place in Pahang Tenggara, which is almost a neighbour to Trengganu Tengah, and in Johor Tenggara further down the coast. These states in the past have been the largest receivers of migrants from Trengganu (Fig. 3.1) and the increased development there may intensify this movement. Certainly, they are likely to be directly competitive with Trengganu Tengah in the minds of potential migrants.

On the northern side of the State, Kelantan has historically provided Trengganu Tengah with the majority of its Malay inter-state migrants. Unlike other states, it has been a particularly important source of rural as opposed to urban migrants. Furthermore, it has been suggested, though not officially, that Kelantan might prove to be suitable source of labour for Trengganu Tengah. However, Kelantan now has its own regional development plans[9] and the implications of this need to be incorporated in any examination of migration trends. The Kelantan study has analysed past migration from the State, which has been quite considerable, but has decided to assume "zero net migration between 1970 and 1985," both to fix "an employment target based on the estimated labour force ... if sufficient job opportunities can be generated" and because "migration . . . will be determined by the success of the Federal and State Governments in implementing the projects and programmes in this Report (and) . . . will be affected . . . by developments in other states of West and East Malaysia (which) are largely unpredictable in quantitative terms." [8] The second reason is a largely pragmatic one which applies equally to this study. The first, however, implies an overall objective to find sufficient jobs to match the growth of the labour force. Since the study discusses net migration, this does not necessarily mean that there will be no future migration from Kelantan to Trengganu, but it does mean that it would be unwise to rely on Kelantan as a major source of labour for Trengganu Tengah. Fortunately, the analysis earlier in this chapter indicates that this may not be necessary, provided that the potential migrants identified within the State will be prepared to move to the study area.

Finally, it is necessary to discuss the possible impact upon the study area of the likely development of Kuantan and the neighbouring port of Tanjong Gelang. The Pahang Tenggara Study[1] discussed the possible relationship of Pahang Tenggara with Kuantan, and with certain other regional delineations. The conclusion was that it was desirable to encourage Kuantan as a growth centre for the region, and the result of this decision is a forecast that Kuantan will grow from 43,000 in 1970 to 250,000 persons in 1990, a rate of growth exceeding any other town in Malaysia. In addition there is the future port complex at Tanjong Gelang some 15 miles to the North.

The impact of such urban development so close to the study area cannot be anything but considerable. In terms of migration, it is likely to become a magnet attracting persons from a wide area. Migration into Kuantan and Tanjong Gelang is likely to be both "spontaneous" and "induced." Whilst the past trends have indicated a larger movement of persons from urban to rural than rural to urban, this may well not continue in the light of such nearby urban development. Both the urban youth and fishermen seeking new occupations may be more disposed to seek them in an urban environment, close by the sea, rather than inland in Trengganu Tengah. This questions needs to be raised in the detailed sociological survey mentioned earlier in this chapter, since answers may provide important information on the types of amenities considered necessary by potential migrants in order to atrract them to Trengganu Tengah.

Indeed, the development of Kuantan and Tanjong Gelang may have a more direct impact on the population of Trengganu Tengah, by causing "spontaneous" outward migration from the study area. This has not been allowed for in the population calculations in Chapter 2 or in this chapter, but it does remain a possibility. It is perhaps particularly likely to occur in the southern region of the study area, and may even be the reason for the apparent inability of existing estates in that area (such as NADEFINCO) to obtain an adequate supply of labour.

To sum up, the migration implications of the development plan of Trengganu Tengah are considerable. Projections for Trengganu State indicate no theoretical shortage of labour within the State after 1975. However, the fact that numbers have been calculated does not necessarily mean that people will wish to move. The chief source of potential migrants appears to be among the young; there may also be some 3,000 fishermen changing occupation, although the exact future of the fishing industry is not yet settled. There will be problems which are more likely to overcome if they can be identified at an early stage by means of a sociological survey.

11.5 Projection of Immigrant Population

The immigrant population of Trengganu Tengah has been calculated from the labour force projections, assuming that all excess labour demands over the period are in fact met by inward migration. The method involves estimating the number of households by means of labour force per household coefficients, followed by an estimation of total population by means of average family size.

The labor force per household coefficient, at 1.6 in 1970, changes with time in accordance with the changein participation rates discussed earlier in Chapter 3. Likewise, the average married family size will change over time as the percentage of persons aged 0 – 14 within the total population declines. This decline reflects the fall in the age-specific fertility rates which occur in population projection B in Chapter 3. The changes over time in these two coefficients are shown in Table 11.9, which calculates the total population entering Trengganu Tengah during the study period, divided by sex. This division is according to the sex ratio of migrants shown in Chapter 3 and in Appendix C.

Table 11.9 Trengganu Tengah: Projection of Total Immigrant Population

	1970–75	1975–80	1980–85	1985–90
Immigrant Labour Force (1)	3,770	10,250	4,100	3,150
Labour Force/Household (2)	1.57	1.51	1.45	1.43
Total Households	2,400	6,790	2,830	2,200
Average Household Size (3)	4.50	4.40	4.33	4.29
Total Population	10,810	29,870	12,240	9,450
Percent Male (4)	56.25	56.25	56.25	56.25
Male Immigrants	6,080	16,800	6,890	5,316
Female Immigrants	4,730	13,070	5,350	4,134

(1) Excess of employment requirements over labour force supply net of small scale farmer transfers.

(2) Average figures for the particular years. 1970 = 1.6

(3) Average figures for the particular years. 1970 = 4.55

(4) Based on the migrant male : female ratio of 128.6 : 100 shown in Table C.6.

Table 11.9 shows the enormous population implications of the development of Trengganu Tengah. Total inward migration into the study area is estimated to be 62,370, which is one and a third times as great as the 1990 population using Projection B, and over three and a half times the expected population increase through natural means. Table 11.10 shows the age distribution of the migrants, based upon the percentage distributions for "all communities" shown in Chapter 3.

Table 11.9 still does not show the final implications of this migration, however, since they must all be projected through time to 1990. Therefore, fertility and mortality assumptions have been applied to the immigrant population in the same way as they were applied to the domestic population within the study area. This has been done by taking the migrant population in each quinquenium, as shown in Table 11.9 and assuming for convenience that it arrived at the end of the period in question; thus, the 1970 – 75 migrants were taken to arrive in 1975, the 1975 – 80 migrants in 1980, and so on. These migrant populations were then projected through to 1980 in exactly the same way, and under the same assumptions, as was the 1970 population in Projection B (see Chapter 3 and Appendix C). This means that the migrant population is taken to possess the same demographic characteristics regarding fertility and mortality as the domestic population of Trengganu Tengah, rather than the characteristics of their area of origin, which are not known for certain.

The results of this projection are shown in Table 11.10. Total migrant population is expected to be 10,850 in 1975, 45,250 in 1980, 65,900 in 1985 and 86,250 in 1990.

Table 11.10 Trengganu Tengah: Projection of Immigrant Population by Age and Sex

Age Group	1975 Male	1975 Female	1980 Male	1980 Female	1985 Male	1985 Female	1990 Male	1990 Female
0 – 4	750	750	4,550	4,550	5,800	5,700	7,050	6,900
5 – 9	550	550	2,200	2,300	5,000	5,050	6,150	6,050
10 – 14	450	500	1,750	2,000	2,700	2,850	5,350	5,450
15 – 19	900	700	2,950	2,400	2,750	2,750	3,450	3,400
20 – 24	1,000	600	3,650	2,400	4,050	3,050	3,600	3,250
25 – 29	750	450	3,000	1,800	4,450	2,850	4,650	3,400
30 – 34	500	300	2,100	1,300	3,550	2,150	4,800	3,100
35 – 39	350	150	1,450	750	2,450	1,450	3,750	2,250
40 – 44	250	150	950	550	1,650	900	2,600	1,550
45 – 49	150	150	700	550	1,100	700	1,750	1,000
50 – 54	150	150	550	500	800	650	1,200	800
55 – 59	100	50	450	300	600	550	850	700
60 – 64	100	100	400	300	500	350	650	600
65 – 69	50	50	250	200	400	300	500	350
70 – 74	50	50	150	100	250	200	350	300
Over 74	50	50	100	100	200	200	300	250
TOTAL	6,100	4,750	25,150	20,100	36,200	29,700	46,900	39,350

11.6 Total Population Growth

Total population growth is the combination of growth through natural increase, given in Appendix C, Tables C. 21 to C. 24 and the migration of Table 11.10. The overall growth is shown in Tables 11.11 to 11.14 and may be compared with the initial population of the study area in the base year of 1970 (Table 3.2). The most striking implication of this set of tables is the very great rate of population increase that is implied by the proposed development of the study area. Between 1970 and 1975, total population is projected to rise from 30,660 to 42,750 an increase of 12,100 or 39 percent in five years. This is in spite of the closure of Bukit Besi and resultant emigration. During the next decade the rate of growth is even more rapid. Between 1975 and 1980 it is anticipated that the population will increase by 39,000, or nearly double in just five years to 81,750. In the next five years the increase will be somewhat less, amounting to 29,950, an increase of 32 percent, so that total population by 1985 is expected to reach 107,700. Thereafter the rate of increase falls, since a much lower level of migration is anticipated after 1985, so that by 1990 the total population will be 134,350. Overall, the population will rise by over 100,000 from an initial base of 30,000 in just twenty years, the bulk of the increase coming in the decade 1975 – 1985. Such an increase in population will require major investments in infrastructure such as housing, education and health facilities, which will have to be made available in a relatively small period of time. If such investment is not made, the chances are that the standard of amenities in the area will not be sufficient to attract and retain migrants.

Table 11.11 Trengganu Tengah: Total Population, 1975

Age Group	Male		Female		Total		Males per 100 females
	Persons	Percent	Persons	Percent	Persons	Percent	
0 – 4	3,250	14.2	3,200	16.0	6,450	15.1	101
5 – 9	2,800	12.4	2,900	14.6	5,750	13.4	97
10 – 14	2,650	11.6	2,650	13.3	5,300	12.4	100
15 – 19	2,400	10.6	2,250	11.2	4,650	10.9	109
20 – 24	2,300	10.0	1,800	9.0	4,100	9.6	126
25 – 29	1,950	8.7	1,400	7.1	3,400	7.9	140
30 – 34	1,850	8.1	1,450	7.3	3,300	7.7	126
35 – 39	1,500	6.7	1,100	5.5	2,600	6.1	137
40 – 44	950	4.3	750	3.7	1,700	4.0	130
45 – 49	800	3.4	700	3.4	1,450	3.4	114
50 – 54	650	3.0	600	3.1	1,300	3.0	109
54 – 59	550	2.5	450	2.2	1,000	2.3	130
60 – 64	450	1.9	300	1.4	750	1.7	153
65 – 69	300	1.4	,200	1.1	,500	1.2	143
70 – 74	150	0.7	100	0.5	300	0.6	154
Over 74	100	0.5	100	0.5	200	0.5	126
TOTAL	22,750	100	19,950	100	42,750	100	114.0

Table 11.12 Trengganu Tengah: Total Population, 1980

	Male		Female		Total		
Age Group	Persons	Percent	Persons	Percent	Persons	Percent	Males per 100 females
0 – 4	7,350	16.7	7,300	19.3	14,650	17.9	101
5 – 9	4,600	10.5	4,650	12.3	9,250	11.3	99
10 – 14	4,000	9.1	4,300	11.5	8,350	10.2	93
15 – 19	5,150	11.7	4,500	12.0	9,650	11.8	114
20 – 24	5,150	11.7	3,950	10.4	9,100	11.1	131
25 – 29	4,300	9.7	3,000	8.0	7,250	8.9	146
30 – 34	3,300	7.5	2,250	5.9	5,550	6.8	148
35 – 39	2,750	6.2	1,900	5.0	4,650	5.7	145
40 – 44	2,100	4.8	1,500	3.9	3,600	4.4	141
45 – 49	1,400	3.2	1,150	3.0	2,550	3.1	124
50 – 54	1,100	2.5	1,000	2.7	2,150	2.6	110
55 – 59	950	2.1	750	2.0	1,700	2.1	123
60 – 64	800	1.8	650	1.7	1,400	1.7	125
65 – 69	550	1.2	400	1.0	950	1.1	135
70 – 74	350	0.7	250	0.7	600	0.7	131
Over 74	250	0.6	200	0.6	450	0.6	120
TOTAL	44,100	100	37,650	100	81,750	100	117.0

Table 11.13 Trengganu Tengah: Total Population, 1985

Age Group	Male		Female		Total		
	Persons	Percent	Persons	Percent	Persons	Percent	Males per 100 females
0 – 4	9,100	15.7	8,900	17.8	18,000	16.7	102
5 – 9	7,750	13.4	7,700	15.5	15,500	14.4	100
10 – 14	5,050	8.8	5,200	10.4	10,250	9.5	98
15 – 19	5,000	8.7	5,050	10.1	10,050	9.3	99
20 – 24	6,200	10.7	5,150	10.3	11,350	10.5	120
25 – 29	5,900	10.2	4,350	8.7	10,250	9.5	135
30 – 34	4,750	8.3	3,300	6.5	8,050	7.5	145
35 – 39	3,650	6.3	2,400	4.8	6,000	5.6	152
40 – 44	2,900	5.1	2,000	4.0	4,950	4.6	145
45 – 49	2,200	3.8	1,600	3.2	3,850	3.6	138
50 – 54	1,500	2.6	1,250	2.5	2,750	2.5	121
55 – 59	1,150	2.0	1,050	2.1	2,200	2.0	113
60 – 64	950	1.7	800	1.6	1,750	1.6	120
65 – 69	750	1.3	600	1.2	1,350	1.3	119
70 – 74	450	0.8	350	0.7	800	0.8	129
Over 74	400	0.6	300	0.6	700	0.6	120
TOTAL	57,750	100	50,000	100	107,700	100	115.5

Table 11.14 Trengganu Tengah: Total Population, 1990

Age Group	Male		Female		Total		Males per 100 females
	Persons	Percent	Persons	Percent	Persons	Percent	
0 – 4	10,900	15.2	10,650	16.9	21,500	16.0	102
5 – 9	9,350	13.0	9,200	14.6	18,500	13.8	101
10 – 14	8,100	11.3	8,100	12.9	16,200	12.1	100
15 – 19	5,800	8.2	5,750	9.1	11,550	8.7	101
20 – 24	5,850	8.2	5,550	8.8	11,350	8.5	105
25 – 29	6,750	9.4	5,450	8.7	12,200	9.1	123
30 – 34	6,250	8.7	4,550	7.3	10,800	8.0	137
35 – 39	4,950	7.0	3,350	5.4	8,350	6.2	148
40 – 44	3,750	5.2	2,450	3.9	6,200	4.6	152
45 – 49	3,000	4.2	2,100	3.3	5,100	3.8	143
50 – 54	2,250	3.1	1,650	2.7	3,900	2.9	134
55 – 59	1,500	2.1	1,250	2.0	2,700	2.0	121
60 – 64	1,150	1.6	1,050	1.7	2,200	1.6	110
65 – 69	850	1.2	750	1.2	1,600	1.2	115
70 – 74	600	0.8	550	0.8	1,150	0.8	114
Over 74	550	0.7	450	0.7	1,000	0.7	118
TOTAL	71,500	100	62,850	100	134,350	100	113.8

11.7 Training

11.7.1 Introduction

Section 6 of Appendix C gives an indication of the generally low level of educational attainment of the population of Trengganu Tengah. Even the situation described there may overstate the current position since it includes the labour force associated with Bukit Besi which will almost certainly have had above average education.

A problem in quantifying training requirements exists since not all the growth in the labour force will result from natural population increase. The projected increase in total employment between 1970 and 1990 is 17,000, but of these only some 5,400, or 30 percent, will result from natural increase. The remainder will be immigrant labour force, coming from elsewhere within the State of Trengganu or even beyond and it is not possible to establish the likely educational pattern of future labour force immigrants. This is particularly the case since, as Section 11.4 of this chapter suggested, the majority of the migrants will be amongst the 15 – 29 age group and hence their educational level will depend upon general educational development elsewhere in the State during the next decade.

Furthermore, many of them will already have had job experience and training. Indeed the policy ought to be to encourage migration of skilled as well as unskilled persons so that a well-balanced labour force is formed within the study area. This is an important means of accelerating development of a region which is lacking in skilled and trained personnel at present.

11.7.2 Smallholders and Estate Workers

Most of the formal training in agriculture in Trengganu is undertaken by the (Federal) Department of Agriculture, Education Branch (Table 11.15) and its efforts are mainly directed towards raising the standard of farming among small farmers. Short training courses are held on padi and general agriculture at the Farm Training Centres at Gerai in Besut and at Ajil near Kuala Brang. These centres hold two week residential courses specifically designed for smallholder farmers. Field days are held for those who cannot leave their farms for more than a day. These courses could be an important means of raising standards among the 4,000 or so smallholders who will still exist in Trengganu Tengah in 1990. The Department also runs a Farm Mechanisation Training Centre at Kuala Brang. This offers three month residential courses on the use, maintenance and minor repair of farm machinery including four wheel tractors and implements. It could play a useful role in training some machine operators from projects in Trengganu Tengah if their employers are willing to release them to attend a course.

Apart from these formal training courses, an important role in raising farming standards in the area will be played by the various authorities concerned with the provision of extension services. These are primarily the responsibility of the State, and the State Agricultural Department has an Extension Division which serves farmers throughout the region. This service covers all crops except rubber which is the province

Table 11.15 Agricultural Training Facilities in Trengganu State

Training Centre	Entry Qualification	Subjects	Duration of Course	No. of Courses/ Year	No. of students per year
Farm Training Centre Gerai, Besut	–	Padi culture	2 weeks	± 10	25 – 30
Farm Training Centre Ajil, Kuala Brang	–	Cash crops and general agriculture	2 weeks	± 10	25 – 30
Farm Mechanisation Training Centre, Kuala Brang	–	Operation, maintenance repair of farm machinery	3 months	2 – 3	25 – 30
Agricultural Institute Besut (Open 1976)	LCE Min.	Certificate in Agriculture	3 years	1 intake per year	100 per year

(1) LCE = Lower Certificate of Education

Source: State Director of Agriculture, Kuala Trengganu.

of RISDA. In addition to allocating grants and supervising the replanting of smallholder rubber farms, RISDA also has an advisory service which has taken over the extension services previously offered by the RRI. The State Veterinary Department provides extension services to farmers with livestock and offers assistance in stock improvement by supplying stud animals or artificial insemination services.

The great majority of people employed in the primary sector excluding smallholders will be FELDA settlers or unskilled estate workers, and the most important training for these workers will be done on the job. Although classified as "unskilled" many agricultural workers are required to do jobs which need basic instruction followed by practical application. Rubber tapping is a skill taught on the estate and an area for a "tapping school" should be reserved on each new rubber project to ensure that a nucleus of tappers is available when the trees come into production. Budding of rubber is a more skilled job and budders are frequently employed on contract. Oil palm harvesting requires the ability to recognise when the fruit is ripe but it needs little skill. Every project will require drivers for tractors, trucks and other vehicles and operators for any other machinery used. All these skills can be learnt on the job and it is not considered that this will be a limiting factor in the development of Trengganu Tengah.

Clerical staff on agricultural projects are responsible for office routines such as work attendance, wages, crop returns, store keeping and general record keeping. Literacy is obviously essential for this work and in addition training in book keeping, typing and other office work is desirable. There are facilities for this at the Vocational Training School in Kuala Trengganu, and there should not be a shortage of clerks for the agricultural sector. Location of the estate and scheme offices in the centralised communities will undoubtedly make this type of work much more attractive than it has been in the past.

Of the 600 Clerical/Supervisory employees required for Trengganu Tengah by 1990, more than 450 will be field staff supervising routine operations on estates and settlement schemes. While it is certainly necessary that these people should be literate and possess the basic skills described above, their main requirement will be a dedication to hard and often monotonous work. For the right man, promotion to a managerial position should be the ultimate goal and the attitude of management to the mid-level staff is very important in this respect.

Apart from estate workers there will be a need for some semi-skilled persons on the processing side of the estates, who will work mainly in the oil palm processing mills. Most of these will require a relatively low skill level and will receive on the job training. In addition, some more highly skilled persons will be required, such as maintenance personnel and mechanics. Scope already exists for training such persons at the Vocational Training School and the new Technical College at present under construction at Kuala Trengganu.

11.7.3 Agricultural Management Standards

Table 11.16 shows the expected requirements for managerial personnel in agriculture during the study period. The numbers are not very large amounting to about 100 by 1980, but their educational requirement will be considerable. Management is a combination of education and experience with the latter becoming increasingly important during the life of the individual. However, agriculture has become an increasingly complex profession to follow and if a full understanding and utilisation of the results of research and modern technology are to be achieved, a thorough grounding in the principles and practice of modern agriculture is essential for today's managers. Malaysia has a long tradition of agricultural education and the newly established Agricultural University (Universiti Pertanian) at Serdang emphasise the importance of agricultural training to the national economy. Ideally, then, Managers and Assistant Managers should be graduates or diplomates of the University or have a Diploma from MARA Institute of Technology. With this background they can then build up their experience in the field firstly as assistant managers and later as managers.

There are no facilities at present for graduate or other tertiary training in agriculture in Trengganu, Managerial staff for the projects in Trengganu Tengah will mostly be recruited from outside the State but there are indications that Trengganu natives are returning to their home state having accumulated experience on estates in the West Coast. Because of the rapid pace of development in Malaysia as a whole availability of competent managerial staff may prove to be a constraint during the early years. Conditions of work in Trengganu Tengah must be made attractive enough to encourage the entry of suitable personnel to the area. Without such people, the agricultural development programme cannot be implemented. In the short term, management contracts with private sector agencies may help to overcome this problem. While concentrating on increasing production on their existing estates, some private sector agencies have shown an interest in assisting in new development areas by providing managerial staff on contract and in training future management staff on their estates. The opportunity to avail of this kind of experience should be seriously considered by developers in Trengganu Tengah.

11.7.4 Higher Education in Agriculture

A new Agricultural Institute is being built by the Department of Agriculture at Besut in Trengganu. The Institute is expected to open in 1976 and will offer three year courses for about 100 students a year. Minimum entry qualification is LCE standard, but those with MCE or higher educational attainment will be encouraged to enter. The Institute is primarily for the training of Junior Agricultural Assistants (JAA) for the Department itself but the number of potential JAA's already in training elsewhere exceeds the needs of the Department and it is foreseen that the Institute will be able to play a useful role in training supervisory and potential managerial personnel for the projects in Trengganu Tengah.

Table 11.16 Trengganu Tengah: Managerial, Skilled and Semi-Skilled Manpower Requirements in the Primary Sector

	1975	1980	1985	1990
Agriculture				
Managerial	60	101	113	115
Clerical/Supervisory	236	449	559	604
Forestry (logging for Dungun complex)[1]				
Management and survey	40	76	76	76
Mechanics	10	20	20	20
Semi-skilled[2]	60	127	127	127
Processing (including rubber, oil palm and timber)				
Managerial	7	34	51	56
Skilled and semi-skilled	54	186	287	316
Total Primary Sector				
Managerial[3]	107	211	240	247
Other	360	782	993	1,067
TOTAL	467	993	1,233	1,314

(1) The demand for the Dungun complex will be equivalent to the net additional labour and managerial requirement during the study period in the forestry sector.

(2) Road construction, logging and transport.

(3) Includes forestry survey teams.

On a national level, the functions of the School of Agriculture of the University of Malaya and the College of Agriculture at Serdang have been combined in the new University of Agriculture (Universiti Pertanian) at Serdang which offers three year diploma courses and four year degree courses. The first group of 114 students for the degree course was admitted in 1973 and will graduate in 1977. In the meantime students from the school of Agriculture of the University of Malaya will continue to graduate until 1977. Of the 436 students enrolled in 1973 for degree courses in Agriculture, Veterinary Science or Forestry 240 (55 percent) were Malays,[5] suggesting that this racial group will be playing a dominant role in the management of agricultural and forestry projects in the future.

In addition to the degree courses, the University of Agriculture also offers a three year diploma in Agriculture. The MARA Institute of Technology also offers a diploma course in Planting Industry Management, and diploma holders from both these places are playing leading roles in agricultural management in the country.

There are opportunities for short, in-service courses in estate management offered by the RRI. These take the form of two week seminars on various subjects and and are principally concerned with rubber estate management. The Incorporated Society of Planters (ISP) sets examinationsbased on this and other sources and offers recognised (in Malaysia) qualifications to estate management staff.

The immediate need for trained people in Trengganu Tengah will not be met by setting up training facilities in the area itself. In the long term the present national programme should supply sufficient trained personnel to the agricultural sector. In the short term, there may be a shortage of such people but this problem can partly be overcome by short, in-service training courses for junior management and by utilising the management services of well-established agency houses. These steps have already been taken by some developers in Trengganu Tengah.

11.7.5 Forestry

There is a general shortage of qualified staff in forestry, both in the private and the public sector,and with the planned development of logging for the Dungun complex an additional need for nearly 76 managerial and survey staff and 20 skilled mechanics will be created in the logging industry over the next five years (Table 11.16). The shortage of qualified staff applies equally to teachers, and thought should be given to cutting down duplication by centralisation of training, aligned to national rather than sectoral objectives, in as few institutions as possible, so as to make the most of limited teaching skills and facilities. Forestry in the public sector also needs urgent readjustment of recruiting procedures with salary scales and incentives to attract and hold men with proper qualifications and experience.

Plans for training in the forestry sector are fairly extensive when taken as a whole, but as pointed out above there is a need to avoid duplication of effort, and this need may well not be met. A logging school is being established in Trengganu State (there is also one in Pahang and a third is planned in Perak). A sawmill training school is being established by MARA at Kuantan, and a diploma course in wood technology is starting at the MARA Institute of Technology. The Forestry Faculty at the Agricultural University and the Forestry College are in operation, and diploma level and vocational training in associated industrial activities is also provided at the Industrial Training Institute and the Ungku Omar Polytechnic. Vocational training for skilled workers is available through institutes within each state where special arrangements are also made for on the job training for rural youth.[116]

11.7.6 Non-Primary Industries

This occupational group is likely to be the most important as regards training, but also the most difficult to quantify. This is due in part to the fact that the majority of future employees in the sector will come from outside the study area, many from the urban areas having had various jobs previously. In addition, it is difficult to estimate the future occupational and industrial structure on non-primary employment, particularly since data on occupation by industry is not available at present. A starting point is the distribution of employment by industry which existed in 1970, as shown in Table 11.1. Of the total non-primary employment, manufacturing accounted for 21 percent, construction for 6 percent, commerce for 28 percent, transport for 9 percent, Government services for 9 percent, and the remainder 27 percent.

This breakdown is unlikely to be retained over the fifteen year period during which rapid development will occur. In particular, a substantial increase in the construction sector may be expected, and also perhaps in transport and Government services. Commerce, which might well be one of the sectors somewhat overstated, may fall proportionately, as may some of the services. It is particularly hard to estimate what will happen to the manufacturing sector, since it depends upon the extent to which new processing plants are set up within the study area. Information to date is not encouraging on this point and hence a proportionate decline is forecast, but this could be reversed if adequate Government regulation of location of industry ensured that industrial development took place within the study area. The overall implications of these changes are given in Table 11.17.

The data in Table 11.17 should only be taken as a rough indication of the structural changes likely to occur. The major increases in the period 1970 – 80 are in the construction sector, due to the very considerable demands for housing, roads and public buildings, which will be a feature of the new settlements. This increase is carried over to 1990, although the proportion declines during the second decade. Government services are also expected to increase rapidly, particularly as health and education are expanded, as well as through the increased activities of organisations such as RISDA and FOA. Manufacturing is expected to develop rather more slowly in the first decade and speed up thereafter, although this still implies a doubling of the numbers in this sector by 1980. Little proportional change is projected for the other sectors.

It is clear that the most immediate needs, from the training point of view, are going to lie in the fields of construction and transport. Training facilities for occupations in these industrial sectors already exist at the Vocational Training School at Trengganu, and there are similar facilities at Kuantan. Since the Vocational Training School is intended to serve the whole State it would be unreasonable to attempt to compare the demand for Trengganu Tengah with capacity in the schools without having some idea of the demand for the rest of the State, which requires up-to-date projections by occupation at State level.

At a higher level, the new Technical Institute should be able to cater for the needs of skilled persons requiring training with a more theoretical approach than is offered at present in the Vocational School. Once again, however, this is an institution which will serve the whole State, and it would not be correct to try and match demand for just the study area against its capacity. It does appear, however, that its size will be sufficient to serve the State for the whole of the period under review.

Table 11.17 Trengganu Tengah: Non-Primary Employment

	1970		1980		1990	
	Persons	**Percent**	**Persons**	**Percent**	**Persons**	**Percent**
Manufacturing	400	21.3	750	8.6	1,900	14.0
Construction	110	5.9	2,500	28.9	2,600	19.1
Electricity, gas, water	20	1.0	100	1.2	200	1.5
Commerce	530	28.2	1,400	16.2	2,100	15.4
Transport	180	9.6	950	11.0	1,600	11.8
Government services	160	8.5	1,150	13.3	1,850	13.6
Community services	200	10.6	700	8.1	1,350	9.9
Personal services	180	9.6	650	7.5	1,200	8.8
Other services and miscellaneous	100	5.3	450	5.2	800	5.9
TOTAL	1,880	100.0	8,650	100.0	13,600	100.0

Sources: (a) 1970: Table 11.1 reduced by 20 percent (see footnote 5)
(b) Absolute totals for 1980, 1990 from Table 11.2.
(c) Proportions for 1980, 1990 — see text.

(1) Chapter 13, Tables 13.4 and 13.9 indicate the needs for qualified personnel in health and education. The number of teachers required will be equal to the number of classrooms shown in Table 13.9, which rises to over 800 by 1990.

To conclude, forecasting of training requirements in this sector and matching them against capacity of institutions is not really possible for the study area on its own. This is because such a large proportion of the labour force will come from outside the study area, and the institutions themselves serve the whole State. The most urgent immediate requirements are likely to be in the construction industry, and it is possible that bottlenecks could develop here if, as appears likely, a great deal of construction is going on elsewhere in the State. A more detailed knowledge of the occupational, educational and industrial structure of the labour force is also needed. This should become available as a result of the Manpower Survey currently being undertaken by the Economic Planning Unit. It is to be hoped that this survey will provide data at state as well as national level, particularly since the analysis on participation rates in Chapter 3 showed the divergencies which can occur between the two. Once this information becomes available, an assessment of the training needs for the State as a whole (including Trengganu Tengah) will be needed.

CHAPTER 12

Settlement Pattern

12. SETTLEMENT PATTERN

12.1 Introduction

The Terms of Reference include several goals which have a direct bearing on the settlement planning. In particular, two major objectives are worth noting:

(i) to make available more of the amenities now enjoyed by persons living within an urban environment.

(ii) to ensure that maximum social and infrastructural services are supplied, taking into account necessary economic constraints.

The Pahang Tenggara Study[1] indicated that the level of urbanisation in relation to economic development for Malaysia is low by international standards. A study of town sizes and occupational structure demonstrated that there is no possibility of attaining the social objectives outlined in the Second Malaysia Plan if existing land settlement policies based on relatively small communities are followed in the future. A fairly general acceptance, therefore, is now given to the idea of increasing the population of resource-based communities. One of the main reasons is that larger communities have the potential for providing at a minimum cost a level of social and engineering infrastructure which will compare favourably with national urban standards. Larger settlements provide more diverse job opportunities, contacts and experiences, and their residents would be exposed to new people and new ideas. This would tend to produce a more dynamic population that at present because the general environment would be more varied. Movement both within and between sectors would then be possible, facilitating both horizontal and vertical job mobility.

By contrast, rural and small scale settlements are characterised by a very high proportion of primary activities (including agriculture, forestry, hunting, fishing, mining and primary processing of agricultural products) and a low level of manufacturing, commerce, transport and service industries.

An important finding of the Pahang Tenggara Study was that the critical threshold for a significant mix of primary, secondary and tertiary activities is an urban population of approximately 15,000 (see Section 12.2). This population could begin to support secondary processing industries, manufacturing and a reasonable level of public services. Above this level there would be a steady decrease in primary activities accompanied by an increase in secondary and tertiary activities.

The existing FELDA settlements have failed in the past to provide reasonable levels of social and engineering infrastructure and to this extent will fall short in attaining the goals of the New Economic Policy. The main reason why they have not attained the critical level of urbanisation is that each is based on too small an agricultural development area. In recognition of this shortcoming, both Johor Tenggara and FELDA are revising their settlement policies to fall more in line with that of Pahang Tenggara, tending to centralized population and thereby increase the average size of communities.

Standard FELDA smallholdings have recently been increased from 8 to 12 acres per settler family for rubber and from 10 to 14 acres for oil palm. Unfortunately, these increased areas reduce the population density of settlement schemes and thereby compound the problems of under-urbanisation associated with such communities. At the same time, however, FELDA intends to increase the standard size of a settlement scheme from 5,000 to 15,000 acres and service this area with a single community. In response to this, the Federal Town and Country Planning Department has prepared revised development standards.

12.2 Community Size Standards

A community's size depends on a great many factors, some of which indicate a minimum level and others a maximum level at which a community is likely to function efficiently. These factors are to some extent abstract concepts, and for this reason they should be looked on only as broad indicators in the final determination of community type, size and location. Obviously, special factors influence decisions in particular circumstances and detailed planning is determined primarily by local conditions.

The principal determinants of community size are discussed in Appendix G under the following headings:

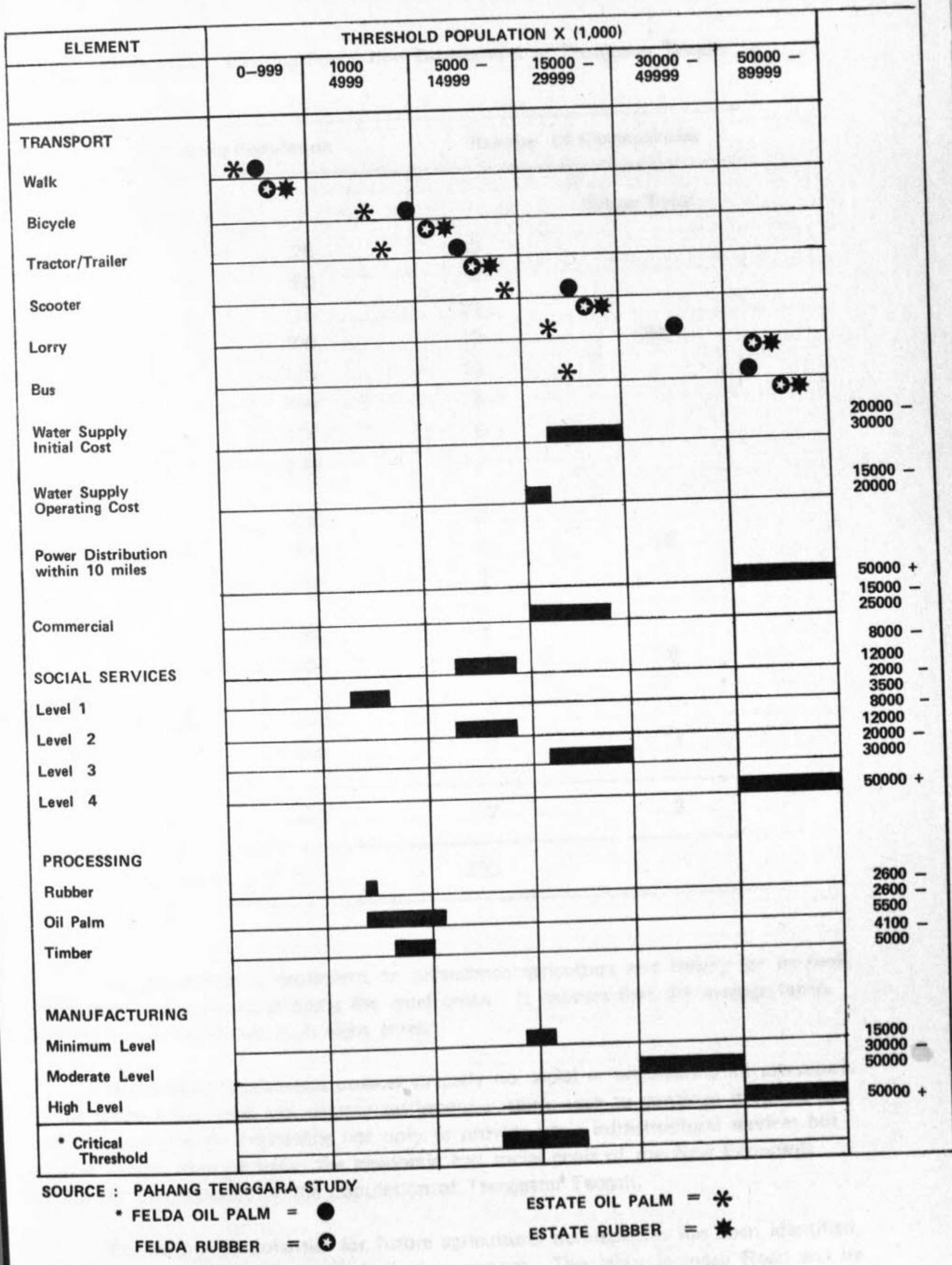
(i) Transport thresholds
(ii) Social services thresholds
(iii) Commercial thresholds
(iv) Processing thresholds
(v) Manufacturing activity and town size

Figure 12.1 brings together the various critical thresholds from Appendix G and helps to determine an optimum threshold for community development. This is shown to be a population of some 10,000 to 20,000. It must be remembered, however, that in determining the optimum, all the individual thresholds were weighted equally, and that the optimum would shift to a slightly higher or lower population if the importance of certain individual thresholds were stressed above others.

12.3 Settlement Proposals for Trengganu Tengah

12.3.1 The Existing Situation

In 1970 there were 30,660 persons in the study area living in 223 separate communities (Table 12.1). Approximately 83 percent of the people live in communities with a population of 200 or less, while 66 percent live in communities of 100 persons or less. The vast majority of these communities are dispersed along the river valleys throughout the region. Many of them are accessible only by boat and a large number are subject to flooding during the monsoon.



CRITICAL THRESHOLD EVALUATION FIG. 12.1

Table 12.1 Existing Population Distribution in Trengganu Tengah

Community Population	Number of Communities	Group Total
1 – 25	80	
26 – 50	34	
51 – 75	21	
76 – 100	13	184
101 – 125	13	
126 – 150	8	
151 – 175	8	
176 – 200	7	
201 – 300	13	
301 – 400	8	28
401 – 500	7	
501 – 750	5	
751 – 1,000	1	6
1,001 – 1,500	3	
1,501 – 2,000	0	3
2,001 – 2,500	2	2
TOTAL	223	

The population is dependent on subsistence agriculture and fishing for its livelihood, with rubber and padi being the chief crops. It appears that the average family holding is marginally less than eight acres.

The existing settlements possess virtually no social or engineering infrastructure. If the present dispersed low density settlement pattern were to continue it is safe to say that it would be impossible not only to provide basic infrastructural services but also to attain, even partially, the economic and social goals of the New Economic Policy for the majority of the population of Trengganu Tengah.

The land with potential for future agricultural development has been identified, but access to most of the area is limited at present. The Jabor-Jerangau Road and its feeder roads will traverse and provide relatively easy access to most of the future agricultural development land.

12.3.2 Proposed New Communities

The pattern of settlement for Trengganu Tengah will inevitably be based primarily on agricultural development and forest exploitation. Of the two, agricultural development is by far the more important in terms of the number of people it has the potential to support. However, a series of settlements based only on agriculture would have serious disadvantages. Towns with a single resource base are vulnerable to market fluctuations, and to variations in crop yields and management expertise, since they do not have the flexibility or the diversity to adjust to drastic changes.

In Trengganu Tengah it is proposed to meet the need for urbanisation and for a widening of the economic base through the establishment of relatively large support communities. The final settlement pattern envisages the creation of eight main communities, each serving a series of agricultural development areas, with a level of social and engineering infrastructure justified by the size of the communities. However, if each of the new communities were to be roughly of the same size,none would be big enough to accommodate some of the necessary sub-regional services. We therefore propose to group the primary support populations in such a way as to create a hierarchy of settlements — with one sub-regional centre, three district centres and four estate towns. While the settlements in the last category will be below the minimum size for attracting a wide range of urban activities, they will have ready access to the wider opportunities in the larger centres.

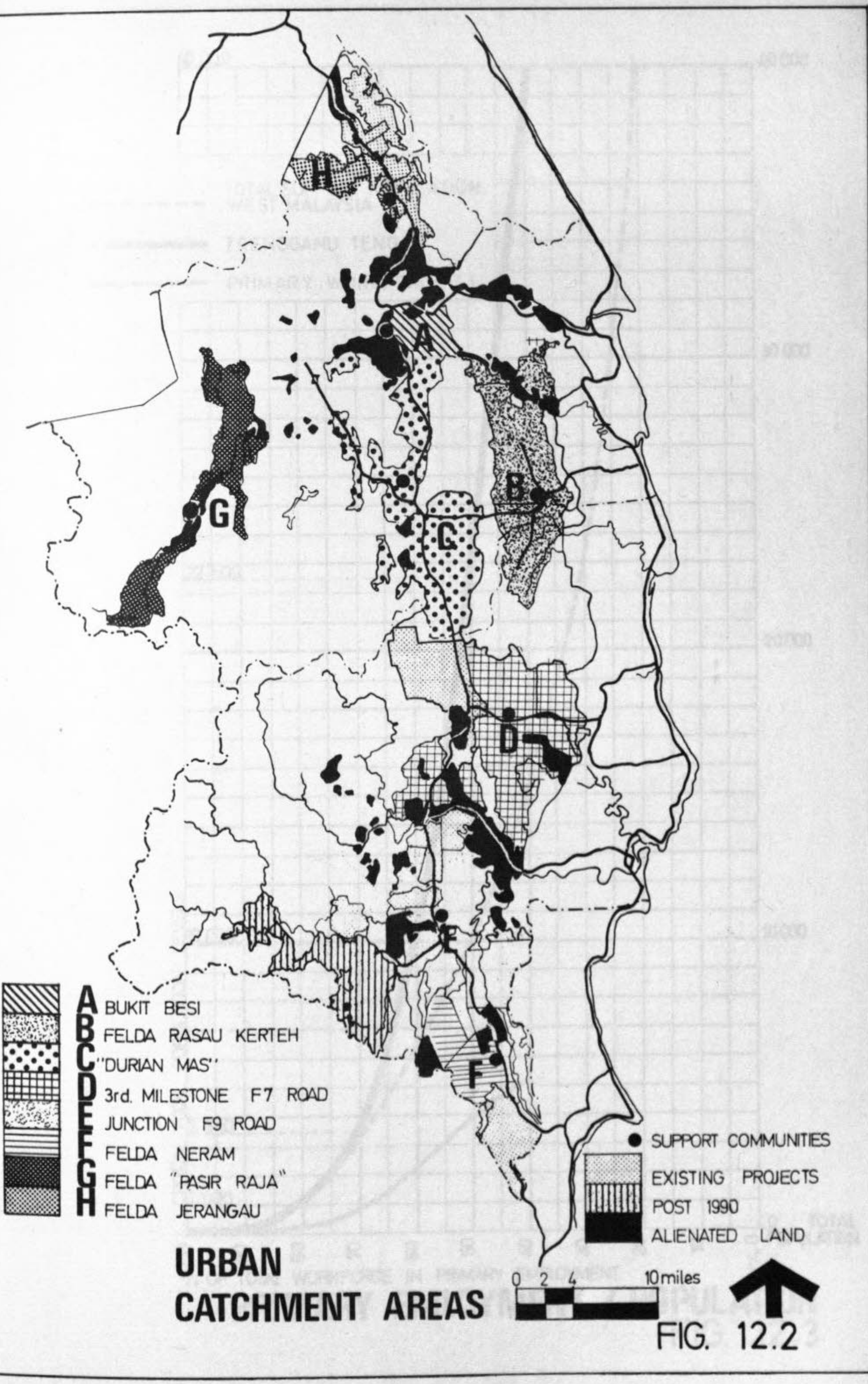
The broad approach to planning the new settlements involved the division of the land proposed for agricultural development into urban catchment areas (Figure 12.2), each of which could be served from a single central community. These areas were defined and their central communities located so that all points in the area were within a maximum travel time (by bus or lorry) of 30 minutes, which is the critical travel time adopted by FELDA for the design of its settlement areas, where workers travel mainly on foot or by bicycle.

12.3.3 Determination of Support Population

The number of primary agricultural and processing workers in each community was calculated using labour multipliers based on recommended crops and proposed settlement types (settler families or direct labour). The number of non-primary workers in each community was then determined using the graph in Figure 12.3, which traces a moving relationship between community size and the ratio of primary to non-primary employment. It should be noted that the difference between the curves for Trengganu Tengah and for Malaysia as a whole in Figure 12.3 is due to two factors:

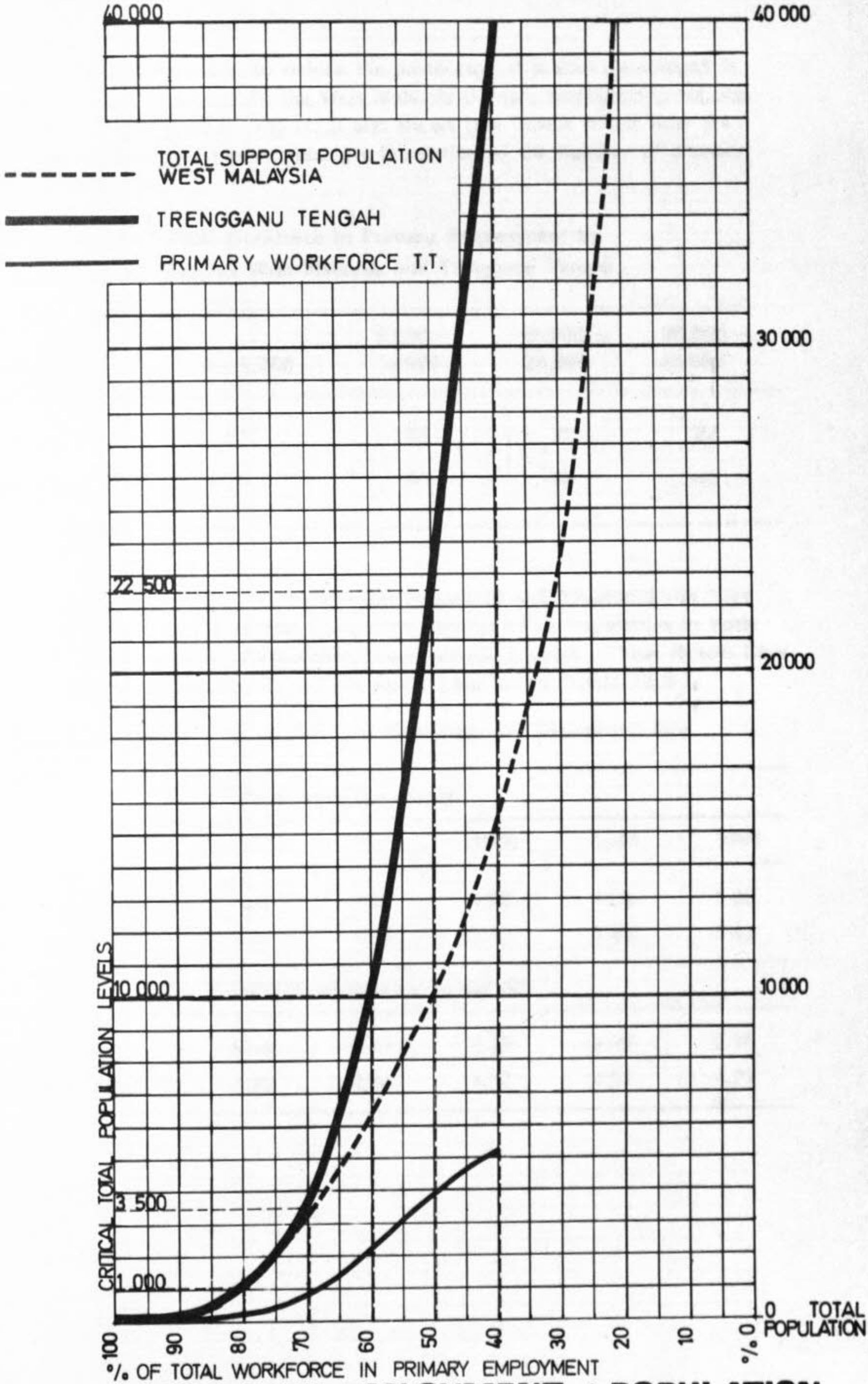
(i) Trengganu Tengah is a new development area.

(ii) The east coast region in general is under-developed by comparison with West Malaysia as a whole.



URBAN CATCHMENT AREAS

FIG. 12.2



PRIMARY EMLOYMENT / POPULATION

FIG. 12.3

Both of these factors tend to reduce the percentage of workers employed in the non-primary sector. As a result, the West Malaysia primary workforce curve was adjusted as shown in Table 12.2. Fig. 12.3 also shows (the lowest curve) how the ratio of primary to secondary workers changes in relation to the number of primary workers in a community.

Table 12.2 Percent of Total Workforce in Primary Employment by Community Size for West Malaysia and Trengganu Tengah

Community Size	0 – 5,000	5,000 – 14,999	15,000 – 29,999	30,000 – 49,999
West Malaysia	67	52	31	22
Trengganu Tengah	75	60	50	40

Projections of the number of workers per household and household size have been made using factors relating workers and total population to households in both FELDA settlement schemes and other types of agricultural projects. These factors have already been discussed in Chapter 11 and are summarised below (Table 12.3).

Table 12.3 Number of Workers per Household and Household Size

	1970	1975	1980	1985	1990
Workers per Household					
FELDA households	1.00	1.00	1.00	1.00	1.00
All other households	1.60	1.54	1.47	1.43	1.43
Household Size (persons per household)					
FELDA household	5.54	5.41	5.28	5.22	5.16
All other households	4.55	4.54	4.35	4.31	4.27

Population projections for each new community, and the type of settlement proposed is shown in Table 12.4.

Table 12.4 Total Population and Settlement Type

Community	Estate Town	District Centre	Regional Centre	1975	1980	1985	1990
A. Bukit Besi	0			1,825	5,543	7,280	7,561
B. FELDA Rasau Kerteh Junction F2		0		200	11,108	13,158	13,015
C. Durian Mas			0	45	14,224	25,950	33,582
D. 3rd Milestone F7		0		41	4,660	6,965	11,881
E. Junction F9		0		133	4,343	9,343	11,738
F. FELDA Neram	0			1,428	4,638	5,481	6,798
G. FELDA Pasir Raja	0			0	0	1,595	7,490
H. FELDA Jerangau	0			3,687	5,752	6,218	6,273
Total population of proposed communities				7,359	50,268	75,990	98,347
Total population of Trengganu Tengah				42,750	81,750	107,700	134,350

The population projection for each of the eight proposed communities broken down by primary and secondary activities (using the relationships established in Fig. 12.3) and by households is shown in Tables 12.5(a) to 12.5(d). These tables also list the agricultural areas served by each community as illustrated in Fig. 12.2.

Table 12.5(a) Primary and Non-Primary Workforce, Number of Families and Total Population by Community

	Community A Bukit Besi Estate Town				Community B FELDA Rasau Kerteh District Centre			
Agricultural Areas Served	Existing settlement plus 107 (40% pop.)				6, 108, 109, 110			
	1975	1980	1985	1990	1975	1980	1985	1990
Work Force								
Primary	95	875	1,140	1,140	37 (2)	1,583 (2)	1,841 (2)	1,841 (2)
Secondary	0	393	587	587	0	929	1,177	1,177
Total	95	1,268	1,727	1,727	37	2,512	3,018	3,018
Primary/secondary ratio	100/0	69/31	66/34	66/34	100/0	63/37	61/39	61/39
Families (1) (dwelling units)								
Primary	62	595	797	797	37	1,583	1,841	1,841
Secondary	0	267	410	410	0	632	823	823
Total	62	862	1,207	1,207	37	2,215	2,664	2,664
Population (1)								
Primary	280	2,589	3,435	3,103	200	8,358	9,610	9,500
Secondary	0	1,163	1,769	1,752	0	2,750	3,547	3,514
Total	280	3,752	5,204	5,155	200	11,108	13,158	13,015
plus existing population (3)	1,545	1,791	2,076	2,406	–	–	–	–
Total population	1,825	5,543	7,280	7,561	200	11,108	13,158	13,015

(1) For workers per household and persons per household see Table 12.3.

	1975	1980	1985	1990
(2) Includes oil palm processing:	–	65	108	108
(3) Existing families as follows:	340	412	480	563

Table 12.5(b) Primary and Non-Primary Workforce, Number of Families and Total Population by Community

	Community C Durian Mas Sub-Regional Services Centre				Community D District Centre – 3 milestone F7 road			
Agricultural Areas Served	7, 12, 13, 14, 15, 111, 107 (60% pop.)				16, 17, 18, 19, 20, 21, 113, 34			
	1975	1980	1985	1990	1975	1980	1985	1990
Workforce								
Primary	15 [2]	2,740 [2]	4,133 [2]	4,836 [2]	14	1,055	1,456	2,268
Secondary	0	2,067	4,477	6,411	0	520	855	1,711
Total	15	4,807	8,610	11,246	14	1,574	2,311	3,979
Primary/secondary ratio	100/0	57/43	48/52	43/57	100/0	67/33	63/37	57/43
Families [1] (dwelling units)								
Primary	10	1,864	2,890	3,382	9	717	1,018	1,586
Secondary	0	1,406	3,131	4,483	0	353	598	1,197
Total	10	3,270	6,021	7,865	9	1,071	1,616	2,783
Population [1]								
Primary	45	8,108	12,457	14,440	41	3,122	4,388	6,772
Secondary	0	6,116	13,494	19,142	0	1,538	2,577	5,109
Total	45	14,224	25,950	33,582	41	4,660	6,965	11,881

(1) See Table 12.3

(2) Includes the following:

	1980	1985	1990
60% Bukit Besi Rubber Est (107)	380	1,352	1,706
Rubber processing	103	103	103
Oil palm processing	65	108	108
Forestry	1,000	1,000	1,000

Table 12.5(c) Primary and Non-Primary Workforce, Number of Families and Total Population by Community

	Community E District Centre, Junction F9 road				Community F Neram FELDA, Estate Town			
Agricultural Areas Served	22, 23, 24, 25, 26, 27, 28, 29, 119, 120				121, 122, 30, 31			
	1975	1980	1985	1990	1975	1980	1985	1990
Workforce								
Primary	45 (2)	998 (2)	1,891 (2)	2,280 (2)	249 (3)	818 (3)	970	1,170 (3)
Secondary	0	470	1,209	1,651	74	385	478	603
Total	45	1,468	3,100	3,931	323	1,203	1,448	1,773
Primary/secondary ratio	100/0	68/32	61/39	58/42	77/23	68/32	67/33	66/34
Families (1) (dwelling units)								
Primary	29	679	1,322	1,594	249	818	970	1,170
Secondary	0	329	845	1,155	48	262	334	422
Total	29	998	2,168	2,749	297	1,080	1,304	1,592
Population (1)								
Primary	133	2,953	5,499	6,808	1,130	3,558	4,181	4,996
Secondary	0	1,430	3,644	4,930	218	1,140	1,440	1,802
Total	133	4,343	9,143	11,738	1,428	4,638	5,481	6,798

(1) See Table 12.3.

(2) Includes the following:

	1980	1985	1990
Oil palm processing	65	84	108
Rubber processing	–	–	103

(3) Includes the following:

Oil palm processing	84	108	108

Table 12.5(d) Primary and Non-Primary Workforce, Number of Families and Total Population by Community

–	Community G Pasir Raja FELDA, Estate Town				Community H Jerangau FELDA, Estate Town			
Agricultural Areas Served	8, 9, 10				1, 2, 3, 4, 105			
	1975	1980	1985	1990	1975	1980	1985	1990
Workforce								
Primary	–	–	267	1,131	572 [2]	862 [2]	927 [2]	946 [2]
Secondary	–	–	67	557	201	406	457	466
Total	–	–	334	1,688	773	1,268	1,384	1,412
Primary/secondary ratio	–	–	80/20	67/33	74/26	68/32	67/33	67/33
Families [1] (dwelling units)								
Primary	–	–	267	1,131	572	862	927	946
Secondary	–	–	47	390	131	267	320	326
Total	–	–	314	1,521	702	1,129	1,247	1,272
Population [1]								
Primary	–	–	1,394	5,856	3,092	4,551	4,839	4,881
Secondary	–	–	201	1,663	595	1,201	1,379	1,392
Total	–	–	1,595	7,499	3,687	5,752	6,218	6,273

(1) See Table 12.3.

(2) Includes the existing labour force of 559.

12.3.4 The Physical Settlement Pattern

The eight new communities in Trengganu Tengah will not replace existing settlements, but they will absorb most of the additional population of the area as development proceeds, and they will provide the necessary services to make the existing small settlements more viable. Ultimately, the region will contain a series of settlement types varying in scale and economic base. These are summarised below, and a more detailed discussion of the main types of settlement follows:

(i)	Kampungs	— Kampungs are scattered throughout the area. — No new kampungs are proposed.
(ii)	Villages	— Include private estate settlements and settler communities. — No new villages are proposed.
(iii)	Estate Towns	— Occur when population from a new development area is sited in conjunction with an existing settlement or "village." — Proposals for this scale of community are kept to a minimum because their small population size make provision of adequate services expensive.
(iv)	District Town	— The population of several estates will be sited in one location to form a single town which will facilitate the provision of an adequate level of social and engineering services at reasonable cost. All the agricultural land served by each town will be within the maximum 30 minute travel time. There will be three of these agro-based communities, each with its own facilities to process the agricultural produce of the surrounding area.
(v)	Sub-Regional Service Centre	— There will be only one community of this scale. It will be a multi resource-based centre relying on agriculture and forestry. — In addition to processing facilities for both rubber and oil palm it will contain a major sawmilling complex, associated wood products manufacturing industries and other industrial and manufacturing establishments. — It will be the administrative, financial and transport centre for Trengganu Tengah.

12.3.5 Existing Kampungs

There are at present about 200 kampungs in Trengganu Tengah. The majority are sited on water courses with the remainder located on inland roads and trails. Even from the sketchy information available on these communities it is apparent that approximately 90 percent of the kampungs located on water courses are subject to some degree of flooding during the monsoon. This, plus the fact that the average kampung has a population of only 138 persons, is reason enough for not using them as nuclei for the formation of new larger communities. Similarly, those kampungs located beside roads are not suitable as a base for further development, because most of the arable land in their vicinities is already under agricultural use and there is little room for urban expansion. In most instances, a segmented land ownership pattern is in evidence, which tends to minimize the opportunity for any future comprehensive agricultural or settlement development.

There is very little which can be done with these small, scattered communities to raise their social and physical amenities above existing levels. However, it is envisaged that, as the hinterland agricultural and forest resources are developed, more of them will have road access and communication with the rest of the region and will tend to make use of amenities in neighbouring communities.

It is recommended that these kampungs, which rely primarily on subsistence agriculture and fishing for their existence should be given access to the credit, marketing and advisory facilities provided by the FOA through its Farmer Development Centres. This should help to raise the level of production in the kampungs and improve their economic standing in relation to larger settlements in the area. In the long-term, further study should be undertaken to assess their long term problems and potential both socially and physically.

12.3.6 Existing Settlement Schemes and Estate Settlements

The communities in this category have developed very recently and are still developing according to traditional settlement policies; they have failed and will continue to fail to meet the social, physical and economic goals of the Second Malaysia Plan owing to their small populations and scattered location. There are approximately fifteen of these communities in the study area, based on either oil palm or rubber cultivation.

With only a few exceptions, there would be insurmountable difficulties in using any of these existing settlements as a basis for the development of a truly urban community. This is due to a number of factors. The estates have reached an equilibrium,which their management will be reluctant to disturb. The introduction of additional settlement modules into them at this stage would mean the removal of some of the existing crops, and the mixed ownership and responsibility of the resulting communities would cause financial and servicing problems. Even if a typical estate community were doubled in size it would still fall below the level needed to justify desirable levels of services.

In view of these problems, there seems to be very little which can be done directly to upgrade the majority of the existing settler and estate communities. However, their amenities may eventually be upgraded marginally in two ways. Firstly, the settlements will be able to rely on a few larger collective communities which will act as service and supply towns at the district and regional level, and these communities will have a population necessary to justify adequate levels of social and physical services (see below). Secondly, eventuall implementation of extension services through the use of mobile units will improve the lot of these existing settlements and upgrade the quality of life within them.

12.3.7 Proposed Estate Towns – Single Agro-Based Communities

In the study area, there are three traditional estate settlements which can be upgraded because sizeable portions of them are not yet fully operational. As a result, the location of the support population for these planned areas is flexible and may be combined with existing settlements within the same estate complex to form larger concentrations of population. One new community of this type is proposed to serve the projected FELDA scheme in the upper valley of the Sungei Dungun. These four settlements are described below.

(i) FELDA Jerangau – Estate Town "H"

It is proposed that the support community for FELDA Jerangau Barat Settlement Scheme (Area 105) should be sited not within the scheme itself as now planned, but in conjunction with the existing Jerangau FELDA settlement at the 35 milestone on the Jerangau-Ajil road. At present this settlement contains 560 families and has a total population of approximately 3,050 persons.

Care must be taken in siting the new portions of this community for there are a number of low lying swampy areas close to the existing settlement. In order that additional population can be sited there it may be necessary either to fill this low lying land or to remove some productive crop. Filling the low lying areas has the advantage of using land which has no alternative use. The cost of filling and the extra cost of building on swampy lands must, however, be weighed against the cost to FELDA of removing some productive crop from better land and compensating the few settler families who would be affected. These settler families could be given alternative plots in Jerangau Barat FELDA Scheme. For every 10 acres of crop removed approximately 50 settler families could be housed.

By locating the two estate populations in one community, less land will be required than if they were sited separately. It must also be kept in mind that, unless these two estate populations are combined in one community, it will be uneconomical to raise the amenity level of either. In addition, other estate settlements located nearby will be deprived of these upgraded amenities.

(ii) Bukit Besi – Estate Town "A"

The ultimate population of the Bukit Besi Rubber estate plus the existing population of Bukit Besi town will not be large enough to achieve minimum levels of social and economic amenity. It is therefore proposed to locate 40 percent (the first phase) of the rubber estate labour force in Bukit Besi town, near to a significant existing mining and kampung population. The remaining 60 percent of the rubber estate labour force and the rubber processing factory with its labour force would be located three miles south of the estate in "Durian Mas", the Sub-Regional Service Centre (Town C). The southern portions of the estate are within easy reach of Town C, and locating this extra population and the rubber factory there would achieve the population and amenity level necessary to attract secondary manufacturing and industrial activities.

There is an existing settlement in the area, and proposals also exist for an additional small settlement in the northern section of the rubber estate. However, portions of the existing settlement are subject to periodic flooding and this fact alone would suggest that it may be desirable to relocate those presently living there. Given the problems of achieving suitable amenity levels in this scale of settlement it is suggested that all future small scale settlement plans for this estate should be abandoned and the population located in or very near to Bukit Besi.

(iii) FELDA Neram I and Neram II – Estate Town "F"

It is proposed that a single community serving Neram I, Neram II and development areas 30 and 31 (Fig. 8.1 Vol. III) should be established to achieve infrastructure savings and higher amenity levels. The oil palm processing mill which FELDA proposes to construct to serve Neram estates and neighbouring FLEDA estates in Pahang should be sited in this town. This community will also serve the existing Orang Asli settlement area to the North.

(iv) FELDA Pasir Raja – Estate Town "G"

It is proposed that development areas 8, 9 and 10 be developed by FELDA as a settlement scheme under oil palm. The proposed centralised community serving these areas will be located about 2 miles north-east of Kg. Pasir Raja. It will be the focal point for social and economic activity of neighbouring kampungs and smallholders. In addition, it is possible that it will function as a supply town serving the surrounding timber complex logging operations.

The agricultural development of areas 8, 9 and 10 and the establishment of even a small urbanised community is very important for the surrounding area. If it were not for this development, the whole of the Upper Dungun River Valley with its many scattered small communities would not be able to enjoy even minimal social and physical infrastructure. The road from Kg. Jengai will give these kampungs easy access to the rest of Trengganu Tengah. Eventually electricity supply and telephone communications will be extended to serve the FELDA community. With the development of FELDA Pasir Raja virtually all of the existing population of Trengganu Tengah will have access to more urbanized communities.

12.3.8 Proposed District Centres — Multi Agro-Based Communities

Communities at this level of the hierarchy will eventually be big enough to attain a truly urban character in respect of social services, physical infrastructure, job mobility and the mix between primary and secondary activities. As the name implies, these communities will function as centres serving several neighbouring estates in the immediate district. They will provide a common settlement area for the workers and management of several estates. Commonly owned and operated facilities for processing agricultural products and a recognisable town centre with all its social and physical amenities will be located in them.

Agricultural workers will travel to their respective estates each day, and communities will be sited so that the maximum journey to work will be approximately 30 minutes. Because the processing will be centralized, it is envisaged that many workers will be able to rely on produce transport vehicles such as lorries and tractor trailers to reach the outlying estate lands.

These communities will act as centres for economic and social activities on a district scale serving existing nearby kampungs and smaller estates. Though essentially agro-based, they will be supported by several estates growing various crops. They would therefore achieve economic and social stability which traditional one-crop communities lack. There will be facilities for secondary education and, more important, there will be no need for people with secondary education to leave the community in order to find work, for jobs with varying educational requirements will be available.

Towns in this category are described below.

(i) **FELDA Rasau-Kerteh — District Centre "B"**

FELDA Development Areas 6, 108, 109 and 110 will all be served by a single community sited at the junction of feeder roads F4 and F5. This will provide an excellent opportunity to test the recent FELDA proposals to increase the size of their projects and urbanise the settlers by siting them in a single large community. A palm oil mill serving the whole scheme will be located there also.

According to the agricultural programme the community is expected to be 85 percent complete by 1980 which will mean that results will be available for evaluation at a reasonably early date. The social, economic and management experiences of FELDA Rasau-Kerteh can then be applied to other settlement projects in Malaysia.

(ii) District Centre "D"

District Centre "D", located on feeder road F7 approximately 3 miles east of the main Jerangau-Jabor road, will directly serve development areas 113 and 16 to 21 inclusive. It will also act as district economic and social centre for the main NADEFINCO oil palm estate area (112) as well as various concentrated smallholder groups. There will be a group-owned palm oil mill located in the community.

Although the total collective estate population by 1990 is expected to be approximately 12,000 persons, it is considered that the town's status as a district centre (which normally has a population threshold of 15,000) could be justified due to the close proximity of the NADEFINCO oil palm estate and smallholder settlements which will tend to increase the amenity demand.

(iii) District Centre "E"

District Centre E, located just north of the junction of the Jerangau-Jabor road and feeder road F9, will serve development areas 22, 29, 119 and 120 and will have a population of approximately 12,000 by 1990. After 1990, however, the community could expand considerably if development areas 32 and 33 are opened up for agriculture.

This community will contain centralized processing facilities for both rubber and oil palm and will function as a supply town for logging operations in the Kemaman Complex forestry area.

12.3.9 Proposed Subregional Service Centre – Multi-Resource Based Community

There will be only one community on this scale in Trengganu Tengah. This community will be located near Kg. Durian Mas just north of the junction of the F2 feeder road and the Jerangau-Jabor road. It will be the highest level of community in Trengganu Tengah and will be based not only on agricultural development but also on forest resource development. Because it is based on two primary resources it is envisaged that it will offer more diverse job opportunities and will be economically and socially more stable than any of the single resource based communities in the study area.

The town will contain the population supported by the southern 60 percent of SEDC Bukit Besi Rubber Estate, oil palm estate areas 111 and 13 and mixed agricultural areas 7, 12, 14 and 15. It will also contain processing facilities for both agricultural products and forest products, consisting of a rubber factory, palm oil mill and sawmill complex. It is a logical location for initial secondary processing and manufacturing which may take place in the area and for centralized administrative functions and financial and transport facilities. Functionally, the sub-regional service centre will be ranked on a par with Dungun and Kemaman but below Kuala Trengganu and Kuantan. It will be located close to the centre of development in Trengganu Tengah, approximately equidistant from Dungun and Kemaman.

The Consultants consider that it is highly desirable for the wood-based industrial complex in the Dungun forest area to be sited in the proposed sub-regional service centre. The economic reasons for this have been discussed in Chapters 9 and 10. Without this addition to its industrial base, both in terms of population and economic activity, it is unlikely that Community C could sustain the level of services and infrastructure proposed. The population of Trengganu Tengah as a whole would thus be deprived of those very benefits which are one of the basic reasons for the development of the area.

12.4 Urban Land Requirements

The urban land needed in each community is related to the number of dwelling units proposed, the density of population (which varies according to the town type) and the percentage of residential land to total urban land. An approximate breakdown of urban land use in a typical community of 15,000 people is shown in Table 12.6.

Table 12.6 Urban Land Use Distribution for Town of 15,000 Population

Urban Land Use	Percent of total urban area
Residential	50
Town centre (commercial)	8
Industrial	6
Educational and Open space	8
Roads	10
Utilities	2
Special reserves (burial grounds, Government buildings, etc.)	10
Residual uses	6

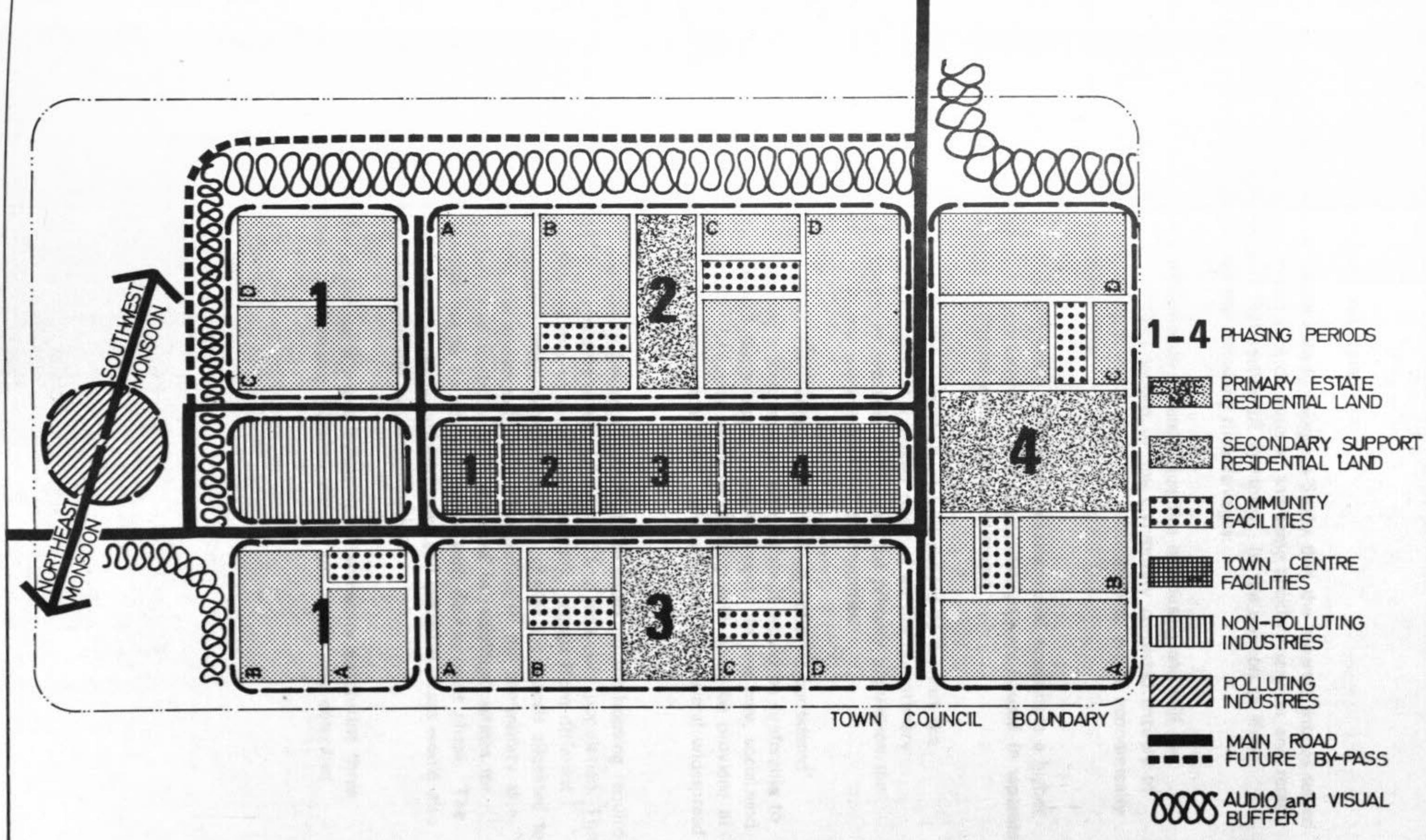
Sources: Trengganu Tengah Study
Merancang Pekan FELDA – Town and Country Planning Department

Urban land use in the proposed new communities in Trengganu Tengah and the total area required is shown in Table 12.7.

Table 12.7 Trengganu Tengah: Urban Land Requirements

Community	1990 Population	Dwelling Units	Dwelling [1] units per acre	Total residential acreage	Residential land as per cent of total urban	Total urban land use
A	7,561	1,770	4	440	60.0	735
B	13,015	2,664	6	440	50.0	880
C	33,582	7,865	9	875	40.0	2,185
D	11,881	2,783	6	465	50.0	930
E	11,738	2,749	6	455	50.0	910
F	6,798	1,592	4	400	60.0	665
G	7,499	1,521	4	380	60.0	635
H	6,273	1,272	4	320	60.0	535
TOTAL	98,347	22,216	–	3,775	51.0	7,475

(1) Trengganu Tengah Study Assumptions.



COMMUNITY STRUCTURE & PHASING
FIG. 12.4

12.5 Internal Community Structure

It was proposed in the Pahang Tenggara Study that the separate estates served by a single community should provide housing and some ancillary services and retain ownership and control over that section of the town. In the opinion of the Consultants this policy has the following disadvantages:

(i) Different estates will provide different qualities of housing and will pay different wage rates. If a distinct section of any community consisted entirely of people working on a single estate there would be a tendency to create economically and socially stratified communities.

(ii) Different rates of development of different estates would necessitate a higher expenditure on transport and infrastructure if their populations were housed in separate quarters than if they were integrated within each settlement.

(iii) As a community grows the proportion of land needed to support the non-primary population will increase at a greater rate. If all the non-primary population were to be located in one area away from the primary population the result again would be a tendency towards statified communities.

For these reasons, some modification of the Pahang policy is considered necessary. Instead of allocating a large area to each estate it would be preferable to allocate small areas within each major phase of development. In this way, social and physical infrastructure for any particular phase of urban growth could be provided at a lower cost than if development in each phase were scattered over several widespread areas.

Each phase of community development would be based on the housing requirements of each estate plus the probable requirements of any secondary population. This would provide for an effective mix of social and economic groups from different estates together with the non-primary population. The smaller the parcels allocated to each estate in each phase, the greater will be the integration of the community as a whole. Large enough parcels of land would be allocated to individual estates for economic scales of development to be possible within each development phase. The town centre, commercial support, social infrastructure and industrial areas would also be phased and specific areas reserved for each function.

Fig. 12.4 shows a typical abstract layout of a community supporting three estates and demonstrates how phasing could be carried out in the way described.

12.6 Implementation

The responsibility for establishing phased community structure plans should be allocated as soon as possible in order that supporting construction can proceed smoothly once agricultural development commences.

Ideally LKTT should function as a development monitoring agency, acting in a coordinating, supervising and executive capacity to ensure effective overall implementation.

The chance of successful community development can be enhanced if centralized processing facilities are located in the community. Although centralized processing appears logical in principle and is indeed desirable and necessary for totally successful community development, there are possible technical, managerial and transport problems which require detailed investigation before the final form of any central processing can be firmly determined.

The following is a list of critical points in order of occurrence which will be encountered in the process of developing the new communities in Trengganu Tengah. Where applicable, appropriate suggestions have been made outlining what actions should be taken and from where the expertise to undertake those actions will come.

	Critical Point	Action	Agency Responsible
1.	Trengganu Tengah proposed settlement pattern presented to Government.	Assume Government accepts recommendations of report and gives approval to continue along lines listed in report.	EPU, LKTT (Government of Malaysia.
2.	Master Plan Study for proposed towns.	Study should be started as soon as possible and should undertake the following:– (a) Confirm or make alternative town site recommendations for proposed towns based on topography and micro-site considerations. (b) Do detailed contour survey covering whole of proposed town area. (c) Produce 1990 master plan with physical phasing.	LKTT in conjunction with EPU go to Dept. of Town & Country Planning or employ consultants.
3.	Action Area Design.	Within each proposed town, early phased areas should be designed in sufficient detail to allow construction to begin immediately.	Continuation of Department of Town & Country Planning or consultants' work.

	Critical Point	Action	Agency Responsible
4.	Development Authority	Authority to control development of Trengganu Tengah. It should determine and enforce housing, service and construction standards including fire and safety codes.	LKTT drawing on expertise from various apprppriate public and private sector bodies in Malaysia.
5.	Local council, functioning also as Town Board is set up to take care of development in each community and its hinterland support area.	Utilizing the community master plan and development standards as guidelines, the joint Local Council/ Town Board would be responsible for timing of development and allocation of land parcels to estates, government bodies and secondary support population for residential, commercial, industrial and social infrastructure development.	Joint Local Council/Town Board made up of representatives from the traditional urban elements such as JKR, Health, Police, Welfare and Education, plus LKTT plus representatives from surrounding estates, kampungs and smallholders groups.
6.	Land Clearance and Service Infrastructure Development.	Based on master plan Local Council sells or allocates lots or block of lots to developers for clearance and building. Developers may be Government housing agency, individual estates, private building speculator or a combination of all of these. Local Council or developers put in major infrastructure. If Local Council or other Government bodies do this then developers are assessed for the capital cost. If developers provide this infrastructure then it must be up to Local Council Standards and it is turned over to them for administration and maintenance. Individuals (secondary SUPPORT POPULATION) are either allocated areas in which the Local Council supplies the infrastructure and the individual is assessed taxes for maintenance or, they purchase a lot from a developer in which case the purchase price includes the cost of infrastructure. Town centre functions would be built by a combination of public and private sector effort.	Private estate, private developers and/or SEDC + UDA according to standards laid down by LKTT and the Local Council.

CHAPTER 13

Infrastructure

13. INFRASTRUCTURE

13.1 Introduction

In assessing the infrastructural needs of the study area desirable minimum standards for Peninsular Malaysia in general have been used. These standards, particularly of housing and public utilities, are much higher than exist at present. Taken together, they will require a very heavy investment of public funds throughout the development period. There can be no doubt, however, of the justification for such an investment if the programme of development is to be a success. It is clear from Chapter 11 that success will depend greatly on the inflow of migrants from other parts of the State, many of whom will be leaving more attractive coastal or urban areas. Such people are unlikely to settle permanently unless an adequate social and physical infrastructure is provided in addition to the prospect of regular employment. This chapter quantifies the infrastructural requirements and summarises their cost.

The unit costs used in this study are for the most part those set out in the Working Paper No. 51 of the Pahang Tenggara Regional Master Planning Study.(1) Since these were calculated in November 1971, a 30 percent increase has been applied to bring them to 1974 prices. A more detailed evaluation of infrastructural costs has not been attempted within the scope of the present study.

13.2 Physical Infrastructure

13.2.1 Housing

The cost of housing for estate management and workers has been calculated as a capital cost in the cash flows for the estates themselves in Chapter 15, but for completeness it is also included in the total housing cost estimates shown in Table 13.2. Estate and non-estate housing are separated in the table since they will be financed from different sources. The total investment for housing in Trengganu Tengah has been calculated from the community development figures shown in Table 12.5. The proposed eight new communities will eventually house some 98,000 people out of the total population of 134,000. Thus they will account for nearly all the expected increase in population from 1970 to 1990. The housing costs to be incurred by the estates are included in the total cost of housing within the new communities. Thus non-estate housing costs have been calculated as a residual.

The cost of a traditional FELDA housing unit at 1974 prices is estimated to be a minimum of $4,000. Adequate low-cost urban or semi-urban housing, however, cannot now be constructed for that amount, and a figure of $6,000 per dwelling is considered a minimum to provide the necessary incentives for migrants into the new communities, whether or not they are settlers or estate workers. Maintenance costs amount to 2 percent of cumulative capital costs per annum.

13.2.2 Urban roads

The urban road network must consist at least of all-weather laterite roads giving access to each dwelling. The road frontage per dwelling will vary with the density of each community. However, assuming shared frontages on all roads, an average frontage of 10 yards per house has been used for the cost estimates. One mile of laterite road is estimated to cost $65,000 with 5 percent per annum maintenance costs. Thus each dwelling has an associated cost of $370, with $18.5 per annum maintenance. These costs are included in the estimates in Table 13.2.

13.2.3 Water Supply

Each of the proposed new communities should ultimately be served by a properly designed and maintained centralized water system providing water to each dwelling. During the early stages of development, however, it is probable that ground water will be used from private and shared wells. When the basic piped water supply system is constructed, water would then be obtained from taps serving neighbourhood groups. Eventually this piped system would be extended to serve individual dwellings. The total cost of water supply has been calculated using the per capita costs estimated in the Pahang Tenggara Working Paper,(1) page 65. Costs per capita vary according to the degree of centralisation, expressed in the working paper in six hypothetical models. The highest degree of concentration (Model 6) envisaged a population centre of 20,000 to 40,000 people, which is appropriate to community C in the present study. For the other communities proposed for Trengganu Tengah the most appropriate model is Model 2 where the recommended medium settlement numbers 7,000 – 12,000 people. In Table 13.1 the capital and operating costs applying to Models 2 and 6 are set out on a per capita and per household basis. A summary of water supply costs for the whole study area is included in Table 13.2.

13.2.4 Electric Power

A reliable power supply is vital to the establishment of a modern urban community. With the siting of the main transmission line from Kuantan to Kuala Trengganu along the proposed Jerangau-Jabor road it should be possible to provide an adequate power supply to serve the proposed new communities. In addition, it will eventually be feasible to extend the distribution systems to provide power to many of the existing small settlements and perhaps even to smallholder communities. As with water supply, the scope of the present study does not allow a detailed investigation of power supply costs. Consequently, it has been necessary to rely on the same method of estimation as was used for water supply. The relevant costs per capita and household are listed in Table 13.1 and the total community costs are summarised in Table 13.2

Table 13.1 Trengganu Tengah: Cost Basis for Water Supply and Power

	Electricity		Water Supply	
	Model 2[1]	Model 6[1]	Model 2	Model 6
Capital cost per capita[1]($)	250	184	306	127
Capital cost per dwelling [2]($)	1,125	828	1,377	572
Operating cost as percentage of capital cost [1]	18.7	11.4	11.0	17.8

[1] Taken from Pahang Tenggara Masterplanning Study Working Paper No. 51. Updated by 30 percent to 1974 prices.

[2] Assumes 4.5 persons per household.

13.2.5 Summary of Housing, Water and Power Costs

Table 13.2 summarises the total costs of housing,urban roads, water supply and electricity by 5 year periods from 1975 to 1990. These estimates are, of course, only indicative, since no detailed survey work or site investigation came within the scope of the present study.

13.2.6 Main Road Network

The main transport artery for the study area will consist of the Jerangau-Jabor road, which is described in some detail under existing and proposed infrastructure in Section 6.3. This road and associated feeder roads will provide direct access to the majority of existing and proposed agricultural projects in Trengganu Tengah scheduled for development by 1990. However, there are two instances where access to project areas has not yet been planned. First, access to Area 19 from town D (which is located on Feeder road F7/F8) should be provided through Area 17. This access road (designated F10) would be some three miles in length, but it would need to be metalled.

Secondly, if Areas 8, 9 and 10 are to be developed it will be necessary to provide public access to them. This road should ideally extend from Kampung Jengai approximately 15 miles to Pasir Raja following the Sungei Dungun Valley. This road (designated F11) would serve a dual purpose in that it would provide access to the agricultural development areas as well as a link between the smallholders along the valley and the rest of the region.

Table 13.2 Trengganu Tengah: Estimated Costs of Housing, Urban Roads, Water Supply and Power, 1975 – 90, at 1974 Prices

	Average annual expenditure ($'000)			Total expenditure ($'000)
	1975 – 1980	1981 – 1985	1986 – 1990	1975 – 1990
Capital Costs				
Estate housing (from Chapter 15)	4,858	2,815	1,316	49,803
Other community housing	5,082	4,285	4,818	76,007
Total housing capital costs [1,2]	9,940	7,100	6,134	125,810
Urban roads capital costs	613	438	378	7,758
Water supply capital costs	1,843	1,187	1,111	22,548
Electricity capital costs	1,702	1,168	1,040	21,252
Total capital costs	14,098	9,893	8,663	177,368
Operating and Maintenance Costs				
Housing maintenance	596	1,548	2,210	22,366
Road maintenance	92	239	341	3,452
Water supply operation	672	1,723	2,446	24,877
Electricity supply operation	654	1,706	2,442	24,664
Total maintenance and operating costs	2,014	5,216	7,439	75,359
GRAND TOTAL	16,112	15,109	16,102	252,727

(1) The number of new dwellings established in each period is as follows (see Table 12.5)

	1975–80	1981–85	1986–90
Community C	3,270	2,751	1,844
Other communities	6,670	3,165	3,268
TOTAL	9,940	5,916	5,112

(2) Capital expenditure is calculated on the numbers of new units added in each period. Operating costs are calculated on the cumulative number of units in operation at the mid-point in each period. All expenditures are shown as annual averages.

The original (1973) cost estimate for the road network was $45 million. Since then, however,costs have risen considerably and now stand at an estimated $65 million, a rise of nearly 45 percent. Such an increase is quite consistent with inflation rates experienced in engineering and construction costs elsewhere in the world over the last year. Thus, a reasonable estimate of maintenance costs, originally put at $3,500 per mile per year, would be $5,000 at present prices.

Since design work and tendering are currently under way, a precise phasing of costs is not available. However, the intention is to complete construction of the 120 miles of road by the end of 1977, and most of the $65 million will be expended in the period 1975 to 1977. Thereafter, maintenance costs should amount to $600,000 per year. The additional 15 miles of road to give access to areas 8, 9 and 10 will not be required until 1982. Its cost at 1974 prices should be in the order of $8 million, with annual maintenance of $75,000.

Table 13.3 is a tentative assessment of the total expenditure on main highways and feeder roads from 1975 to 1990.

Table 13.3 Trengganu Tengah: Estimated Expenditure on Main Road System 1975 – 1990

Years	Capital	Maintenance	Total
	$'000		
1975 – 1977	65,000	–	65,000
1978 – 1980	–	1,200	1,200
1981 – 1985	8,000	3,000	11,000
1986 – 1990	–	3,375	3,375
TOTAL	73,000	7,575	80,575

13.2.7 Other Physical Infrastructure

Apart from major expenditure on roads, housing, water and power, most of which will be financed by the public sector, other less easily quantifiable needs will be basic to the development of viable urban communities. These are discussed below in general terms, but are not included in the overall infrastructural costs. Public transport has been regarded for planning purposes as a self-financing enterprise which must grow out of the private sector in response to a consumer demand. The other items, telecommunications and sewage disposal, require public investment but not on a comparable scale to that needed for housing, water, roads and power.

With the development of urban communities in Trengganu Tengah the safe disposal of human and domestic wastes will become critical. The present methods of waste disposal in urban areas of the State cause definite health hazards. As a minimum acceptable standard, human waste in the proposed urban communities should be treated, using a properly designed and maintained septic tank system. In rural or low population density areas a pit latrine system should be adequate, but care must be taken in these areas if wells are used as the source of potable water. As the town centres develop and building densities increase, it may be necessary to provide a piped sewerage system and centralized treatment facilities to serve these areas. Trengganu Tengah is in a high rainfall area, and consequently particular attention must also be paid to the provision of adequate storm water drainage systems to handle peak flows.

The Telecommunications Department plans to provide extensive telephone serivces to Trengganu Tengah. It will employ a series of local exchanges using overhead lines. These exchanges will be linked with each other and with the national network by microwave transmitter. The cost of such a system, assuming FELDA standards of one telephone per 100 dwellings, would be in the region of $10 per capita. Thus, the ultimate level of investment over the period 1975 – 1990 could be $1 million, the major part of which would occur in the period 1975 – 80.

13.3 Social Infrastructure

13.3.1 Health Services

The State Health Department has stated that it will in future attempt to maintain a minimum ratio of two hospital beds per 1,000 population. There are plans to build a new regional hospital in Kuala Trengganu, replacing the existing facility and providing a specialized service for the whole State. Less specialised hospital services, however, will be provided at local level, and for planning purposes it is assumed that all the needs of Trengganu Tengah will be met in the area itself.

Using the existing State and national planning standards, estimates have been made in Table 13.4 of the future health services needed in Trengganu Tengah, based on population projections. The numbers in the table represent units of service but not necessarily separate establishments. For example, where several midwife clinics are needed in one community, it is probable that some will be combined in a single establishment and perhaps incorporated in larger establishments such as health sub-centres. Nevertheless, Table 13.4 represents a reasonable basis for estimating expenditure on health, allowing for a steady improvement in the level of services as the population rises.

Table 13.4 Trengganu Tengah: Projected Health Services

	Support population per unit	1974 (1)	1975	1980	1985	1990
Cumulative numbers of service units for costing						
Midwife clinics	2,000	10	21	41	54	67
Health sub-centre	10,000	3	4	8	11	13
Dental clinics	20,000	0	2	4	5	7
Main health unit	50,000	0	0	1	2	2
Associated beds and personnel						
Hospital beds	500		86	164	215	269
Doctors	4,560		9	18	24	30
Nurses	3,200		14	26	35	43
Dentists	7,000		6	12	16	19
Total population of Trengganu Tengah			42,750	81,750	107,700	134,350
of whom (percent) live in:						
Community A			4.3	6.8	6.8	5.6
B			0.5	13.6	12.2	9.7
C			0.1	17.4	24.1	25.0
D			0.1	5.7	6.5	8.8
E			0.3	5.3	8.7	8.7
F			3.5	5.7	5.1	5.1
G			–	–	1.5	5.6
H			8.6	7.0	5.8	4.7
TOTAL			21.9	61.5	70.7	73.2

(1) Existing Units.

The precise locations of the various amenities will be determined largely by the distribution of population between the eight main communities, which is indicated in percentage terms in Table 13.4. The communities themselves, however, will represent only 73 percent of the total population of the study area, and some of the midwife clinics will undoubtedly be located outside the main community areas.

The dental clinics have been described in Table 13.4 as separate units, again for costing purposes. In practice, they will probably not be located specifically in any of the communities, since they will be mobile units covering the whole area.

The two main health units will probably be built in 1980 and 1985 and would best be located in Community C and Community E respectively.

Table 13.5 shows the total capital and operating costs of the health service from 1975 – 1990 expressed on an annual basis for the six year period 1975 – 1980 and the five year periods 1981 – 1985 and 1986 – 1990.

Table 13.5 Trengganu Tengah: Cost Estimate for Health Services, 1975 – 1990

	Annual Average Expenditure[1] $'000				Total expenditure
Capital Costs	**Capital costs per unit ($'000)**	**1975 – 1980**	**1981 – 1985**	**1986 – 1990**	**1975 – 1990**
Midwife clinics	23.0	119	60	60	1,314
Health Sub-Centres	234.0	195	140	94	2,340
Dental Clinics	234.0	156	47	94	1,641
Main Health Units	468.0	78	94	–	938
Total Capital Costs		548	341	248	6,233
Operating Costs	**Annual operating costs per unit ($'000)[2]**				
Midwife Clinics	5.0	130	240	310	3,530
Health Sub-Centres	73.0	438	730	876	10,658
Dental Clinics	73.0	146	365	438	4,891
Main health units	186.0	–	186	372	2,790
Total Operating Costs		714	1,521	1,996	21,869
Total Health Costs		1,262	1,862	2,244	28,102

(1) See Table 13.2 Note(2).

(2) Annual operating costs based on the estimated number of facilities in use in mid-period.

13.3.2 Education

In planning the educational needs of the study area at primary level it has been assumed that by 1975, 80 percent of the age group will attend school and that this will rise to 100 percent by 1980. Based on Ministry of Education standards, a single primary school will be equivalent to 12 classrooms, and double use of school buildings or double shift teaching will be acceptable.

Total numbers of secondary school children aged 12 – 18 years were determined from the population projections by 5 year period. The proposed target for secondary school attendance is 20 percent of the age group for 1975, 35 percent for 1980, 50 percent for 1985, and 65 percent for 1990.

The Ministry of Education aims to control the average size of secondary school classes at 40 pupils and the average school building at 15 classrooms. Where practicable, double use of school buildings will be considered.

Table 13.6 makes projections of future age structure and school enrolment by 5 year periods for Trengganu Tengah. These projections are used as a base for determining the detailed requirements by 5 year period shown in Tables 13.7 and 13.8 and the total educational infrastructure requirements shown in Table 13.9. The costing of educational services is shown in Table 13.10 on a basis comparable with that used for health services in Table 13.5.

Table 13. 6 Trengganu Tengah: Age Structure and School Enrolment Projections

Age Years	1970			1975			1980			1985			1990		
	Population	Primary School Age (1)	Secondary School Age (2)	Population	Primary School Age	Secondary School Age	Population	Primary School Age	Secondary School Age	Population	Primary School Age	Secondary School Age	Population	Primary School Age	Secondary School Age
0 – 4	5,190	–	–	6,450	–	–	14,650	–	–	17,950	–	–	21,500	–	–
5 – 9 (3)	4,650	3,720	–	5,750	4,600	–	9,250	7,400	–	15,500	12,400	–	18,500	14,800	–
10 – 14 (4)	3,330	1,332	1,998	5,300	2,120	3,180	8,350	3,340	5,010	10,250	4,100	6,150	16,200	6,480	9,720
15 – 19 (5)	2,910	–	2,328	4,650	–	3,720	9,650	–	7,720	10,050	–	8,040	11,550	–	9,240
Total 0 – 19	16,080	8,050	4,326	21,150	6,720	6,900	41,900	10,740	12,730	53,750	16,500	14,190	67,750	21,280	18,960
Total population	27,950			42,750			81,750			107,700			134,350		

(1) Primary school age is 6 – 11.

(2) Secondary school age is 12 – 18.

(3) 80% of 5 – 9 group are primary school age.

(4) 40% of 10 – 14 group are primary school age.

(5) 80% of 15 – 19 group are secondary school age.

13.3.2 Education

In planning the educational needs of the study area at primary level it has been assumed that by 1975, 80 percent of the age group will attend school and that this will rise to 100 percent by 1980. Based on Ministry of Education standards, a single primary school will be equivalent to 12 classrooms, and double use of school buildings or double shift teaching will be acceptable.

Total numbers of secondary school children aged 12 – 18 years were determined from the population projections by 5 year period. The proposed target for secondary school attendance is 20 percent of the age group for 1975, 35 percent for 1980, 50 percent for 1985, and 65 percent for 1990.

The Ministry of Education aims to control the average size of secondary school classes at 40 pupils and the average school building at 15 classrooms. Where practicable, double use of school buildings will be considered.

Table 13.6 makes projections of future age structure and school enrolment by 5 year periods for Trengganu Tengah. These projections are used as a base for determining the detailed requirements by 5 year period shown in Tables 13.7 and 13.8 and the total educational infrastructure requirements shown in Table 13.9. The costing of educational services is shown in Table 13.10 on a basis comparable with that used for health services in Table 13.5.

Table 13. 6 Trengganu Tengah: Age Structure and School Enrolment Projections

Age Years	1970 Population	1970 Primary[1] School Age	1970 Secondary[2] School Age	1975 Population	1975 Primary School Age	1975 Secondary School Age	1980 Population	1980 Primary School Age	1980 Secondary School Age	1985 Population	1985 Primary School Age	1985 Secondary School Age	1990 Population	1990 Primary School Age	1990 Secondary School Age
0 – 4	5,190	–	–	6,450	–	–	14,650	–	–	17,950	–	–	21,500	–	–
5 – 9[3]	4,650	3,720	–	5,750	4,600	–	9,250	7,400	–	15,500	12,400	–	18,500	14,800	–
10 – 14[4]	3,330	1,332	1,998	5,300	2,120	3,180	8,350	3,340	5,010	10,250	4,100	6,150	16,200	6,480	9,720
15 – 19[5]	2,910	–	2,328	4,650	–	3,720	9,650	–	7,720	10,050	–	8,040	11,550	–	9,240
Total 0 – 19	16,080	8,050	4,326	21,150	6,720	6,900	41,900	10,740	12,730	53,750	16,500	14,190	67,750	21,280	18,960
Total population	27,950			42,750			81,750			107,700			134,350		

(1) Primary school age is 6 – 11.

(2) Secondary school age is 12 – 18.

(3) 80% of 5 – 9 group are primary school age.

(4) 40% of 10 – 14 group are primary school age.

(5) 80% of 15 – 19 group are secondary school age.

Table 13.7 Trengganu Tengah: Education Requirements in Communities A, B, C, and D – 1975 to 1990

	Community A				Community B				Community C				Community D			
	1975	1980	1985	1990	1975	1980	1985	1990	1975	1980	1985	1990	1975	1980	1985	1990
Total population	1,825	5,543	7,280	7,561	200	11,108	13,158	13,015	45	14,224	25,950	33,582	41	4,660	6,965	11,881
Primary age group	292	760	1,092	1,209	32	1,444	1,978	2,082	1	1,849	3,893	5,373	2	605	1,044	1,901
Number attending school (1)	146	680	1,092	1,209	16	1,155	1,978	2,082	0	1,479	3,893	5,373	1	485	1,044	1,901
Classrooms required (2)	4	15	27	30	0	29	49	52	0	37	97	134	0	12	26	48
Primary schools required (3, 4)	1	1	2	2	0	2	4	4	0	3	8	11	0	1	2	4
Secondary age group	292	760	946	1,058	32	1,444	1,714	1,822	1	1,849	3,347	4,701	2	605	905	1,663
Number attending school (5)	58	266	473	687	6	505	857	1,184	0	647	1,687	3,056	0	212	453	1,081
Classrooms required (2)	2	7	11	17	0	13	21	30	0	16	42	76	0	5	11	27
Secondary schools required (6, 4)	0	0	1	1	0	1	1	2	0	1	3	5	0	0	1	2

(1) 50% of primary age group in 1975; 80% in 1980; 100% in 1985.

(2) 40 pupils per classroom.

(3) 12 classrooms per school.

(4) Local conditions will determine the school building programme, to the extent that double shift working and/or the sharing of buildings between primary and secondary are concerned.

(5) 20% of secondary age group in 1975; 35% in 1980; 50% in 1985; 65% in 1990.

(6) 15 classrooms per school;

Table 13.8 Trengganu Tengah: Educational Requirements in Communities E, F, G and H – 1975 to 1990

	Community E				Community F				Community G				Community H			
	1975	1980	1985	1990	1975	1980	1985	1990	1975	1980	1985	1990	1975	1980	1985	1990
Total population	133	4,343	9,343	11,738	1,428	4,638	5,481	6,798	0	0	1,595	7,499	3,687	5,752	6,218	6,273
Primary age group	21	565	1,401	1,878	228	603	822	1,088	0	0	239	1,200	590	748	933	1,004
Number attending school (1)	11	452	1,401	1,878	114	482	822	1,088	0	0	239	1,200	295	598	933	1,004
Classrooms required (2)	0	11	35	47	3	12	21	27	0	0	6	30	7	15	23	25
Primary schools required (3, 4)	0	1	3	4	1	1	2	2	0	0	1	2	1	1	2	2
Secondary age group	21	565	1,215	1,643	228	603	713	952	0	0	207	1,050	590	748	808	878
Number attending school (5)	4	193	607	1,068	46	211	356	619	0	0	104	683	118	224	467	653
Classrooms required (2)	0	5	15	27	1	5	9	16	0	0	3	17	3	6	12	16
Secondary schools required (6, 4)	0	0	1	1	0	0	1	1	0	0	0	1	0	0	1	1

As in Table 13.7

Table 13.9 Trengganu Tengah: Projected Education Facilities, 1975 – 1990

	1975		1980		1985		1990	
Population	42,750		81,750		107,700		134,350	
	Primary	Secondary	Primary	Secondary	Primary	Secondary	Primary	Secondary
School aged children	6,720	6,900	10,740	12,730	16,500	14,190	21,280	18,960
Percent attendance	50	20	80	35	100	50	100	65
Number attending	3,360	1,380	8,295	4,456	16,500	7,095	21,280	12,324
Required number of classrooms @ 40 students per class for single shift	84	35	214	111	413	177	532	308
of which: urban[1]	14	10	131	66	284	132	393	248
rural	70	25	83	45	129	45	139	60
Equivalent number of classrooms per school school	12	15	12	15	12	15	12	15
Required number of equivalent school units[2]	7	2	18	7	34	12	44	21

[1] Urban normally defined as more than 5,000 population. Taken here to refer to all schools in the new communities,as shown in Tables 13.7 and 13.8.

[2] See Table 13.7, note.[4]

Table 13.10 Trengganu Tengah: Estimated Cost of Education Services

Capital Costs	Capital cost per classroom ($'000)	Annual average expenditure[1] ($'000) 1975 – 1980	1981 – 1985	1986 – 1990	Total expenditure 1975 – 1990
Primary schools rural	28.0	61	258	56	1,936
Primary schools urban[2]	25.0	488	765	545	9,478
Secondary schools rural	30.0	100	–	90	1,050
Secondary schools urban	28.0	261	370	650	6,666
Total Capital Costs		910	1,393	1,341	19,130
Operating costs	**Annual operating cost per classroom ($'000)**				
Primary schools rural	13.0	995	1,378	1,755	21,635
Primary schools urban	13.0	943	2,698	4,400	41,148
Secondary schools rural	50.0	1,750	1,750	2,625	32,375
Secondary schools urban	50.0	1,900	4,950	9,500	83,650
Total Operating Costs		5,588	10,776	18,280	178,808
Total Capital and Operating Costs		6,498	12,169	19,621	197,938

[1] See Table 13.2, Note: 2.

[2] See Table 13.9, Note: 1.

13.3.3 Other Community Services

Tables 13.11 and 13.12 provide a basis for costing other community services over the study period. These are postal services, police, fire services and religious buildings. In Table 13.13 broad estimates of their capital costs are given, but no attempt is made to estimate their operating costs.

Postal agencies will be needed to serve the new communities and their number has been estimated directly from the population projections at a rate of one agency per 3,500 people. Larger post offices will be required for each of the eight main communities, with two offices projected ultimately for Community C. Fire units will be required in each main community, with a second facility being established ultimately in Community C.

For projecting the need for religious buildings FELDA standards have been used. For rural areas one building is required per 2,200 people and in urban areas one building per 1,700 people. For the present study the existing facilities in rural areas are assumed to be adequate and the estimates of future expenditure are based only on the new communities where most of the increase in population will occur. The projected requirements for 1975 (Tables 13.11 and 13.12) are assumed to be met by existing facilities in the case of Communities A and H but the 1975 requirements for Community F are included in the total cost for the period 1975 – 80.

Table 13.11 Trengganu Tengah: Projected Requirements for Community Services, 1975 – 1990, Communities A to E

	1975	1980	1985	1990
	Cumulative numbers of units			
Community A				
Population	1,825	5,543	7,280	7,561
Postal agencies	–	1	2	2
Post office	–	1	1	1
Police station	–	1	1	1
Fire units	–	1	1	1
Religious buildings	1	3	4	5
Community B				
Population	200	11,108	13,158	13,015
Postal agencies	–	3	3	3
Post office	–	1	1	1
Police station	–	1	1	1
Fire units	–	1	1	1
Religious buildings	–	6	7	7
Community C				
Population	45	14,224	25,950	33,582
Postal agencies	–	4	7	9
Post office	–	1	2	2
Police station	–	1	1	1
Fire unit	–	1	2	2
Religious buildings	–	8	15	20
Community D				
Population	41	4,660	6,965	11,881
Postal agencies	–	1	2	3
Post office	–	1	1	1
Police station	–	1	1	1
Fire unit	–	1	1	1
Religious buildings	–	2	4	7
Community E				
Population	133	4,343	9,343	11,730
Postal agencies	–	1	2	3
Post office	–	1	1	1
Police station	–	1	1	1
Fire unit	–	1	1	1
Religious buildings	–	2	5	7

Table 13.12 Trengganu Tengah: Projected Requirements for Community Services, 1975 – 1990, Communities F to H and Total

	1975	1980	1985	1990
	Cumulative numbers of units			
Community F				
Population	1,428	4,638	5,481	6,798
Postal agencies	1	1	1	2
Post office	–	1	1	1
Police station	–	1	1	1
Fire unit	–	1	1	1
Religious buildings	1	2	3	4
Community G				
Population	–	–	1,595	7,499
Postal agencies	–	–	1	2
Post office	–	–	–	1
Police station	–	–	1	1
Fire unit	–	–	–	1
Religious buildings	–	–	1	4
Community H				
Population	3,687	5,752	6,218	6,273
Postal agencies	1	2	2	2
Post office	–	1	1	1
Police station	1	1	1	1
Fire unit	–	1	1	1
Religious buildings	2	3	3	3
Total Trengganu Tengah				
Postal agencies	2	13	20	26
Post offices	–	7	8	9
Police stations	1	7	8	8
Fire units	–	7	8	9
Religious buildings	4	26	42	57
Police constables [(1)]	122	23	308	384
Assistant district offices [(2)]	2	3	4	6
District offices [(3)]	1	2	2	3

[(1)] 1 policeman per 350 population for the whole study area.

[(2)] 1 A.D.O. per 25,000 population for the whole study area.

[(3)] 1 D.O. per 45,000 population for the whole study area.

Table 13.13 Trengganu Tengah: Estimated Capital Costs of Community Services 1975 – 1990

	Average Annual Expenditure[6] ($'000)			Total expenditure
	1975–1980	1981–1985	1986–1990	1975–1990
Postal agencies [1]	20	14	12	250
Post offices [2]	163	28	28	1,258
Police stations[3]	65	13	–	455
Fire units[4]	117	20	–	802
Religious buildings[5]	192	160	150	2,702
TOTALS	557	235	190	5,467

[1] $10,000 per unit
[2] $140,000 per unit
[3] $65,000 per unit
[4] $100,000 per unit
[5] $50,000 per unit
[6] See Table 13.2, Note 2

13.4 Summary of Infrastructure Costs

Table 13.14 summarises the infrastructural costs expected within Trengganu Tengah in the period 1975 – 1990, as they have been identified in this chapter. Where financing from the private sector might be forthcoming, this is indicated, but it can be seen that the great majority of both capital and operating costs will fall on the public sector either through State or Federal Government, International Lending Agencies or through Land Settlement Agencies such as FELDA. Of the total capital costs of $284 million over 16 years, only $50 million, or 18 percent, could be expected from the private sector. Of total operating costs of $262 million, only $5.6 million, or 2 percent, would be in the private sector.

Table 13.4 provides a breakdown of total costs between private and public sector and then breaks the public sector expenditure down into self-financing (or recoverable) expenditure and non-recoverable expenditure which will have to be financed from the tax base, either local or national. As can be seen, a total sum of approximately $300 million exclusive of interest on outstanding capital has been classed as non-recoverable, and will have to be financed either from local or national taxes. This is equivalent to $150 per capita per year throughout the 16 year period. This expenditure covers roads, education, a part of the health bill (see Table 13.14, Note 4) police and fire services, and the cost of religious buildings.

By contrast, housing, water, electricity, postal services and part of the health service are expected to be self-financing. However, the public sector will be expected to provide long-term loans to finance a major part of the initial capital cost of these services and amenities, in addition to the non-recoverable expenditure noted above. The long-term finance required for these services will amount to $124 million, of which $62 million will be needed by 1980.

Some, though by no means all, of the expenditure shown in Table 13.14 would be incurred whether or not Trengganu Tengah were developed. This is true of expenditure on education, if it is assumed that the standards proposed for the region would have been equally available to the migrant population in their place of origin. Much the same can be said of health, police, postal services and other community services.

With regard to housing, the question is less clear. Since the object of opening up Trengganu Tengah is to provide higher levels of income (reflected in better housing among other things) than would have been available to the immigrants elsewhere, it is arguable that at least a part of the proposed housing costs and urban infrastructural costs are a necessary additional cost to the economy which would not have been incurred in the absence of the regional development. At the same time, they are an addition to the social capital of the State and the Nation which has been made possible by the regional development.

In the case of roads, there is little doubt that they represent a financial and economic cost which is a direct component part of the regional development programme, and which would not have been incurred in its absence.

Table 13.14 Trengganu Tengah: Summary of Infrastructural Costs, 1975 – 1990

	Average Annual Expenditure[1] $000			Total Expenditure
Capital Costs	**1975–1980**	**1981–1985**	**1986–1990**	**1975–1990**
Housing,[1] water, electricity[2]	13,485	9,455	8,285	169,610
Urban roads[3]	613	438	378	7,758
Main highways and feeder roads[3]	10,833	1,600	–	73,000
Health services[4]	548	341	248	6,233
Education[3]	910	1,393	1,341	19,130
Other community services[5]	557	235	190	5,467
Total Capital Costs	26,946	13,462	10,442	281,198
Operating Costs				
Housing, water, electricity[2]	1,922	4,977	7,098	71,907
Urban roads[3]	92	239	341	3,452
Main highways and feeder roads[3]	200	600	675	7,575
Health services[4]	714	1,521	1,996	21,869
Education[5]	5,588	10,776	18,280	178.808
Other community services	not estimated			
Total Operating Costs	8,516	18,113	28,390	283,611
Total Infrastructural Costs	35,462	31,575	38,832	564,809
Of which: **Private sector**				
capital	3,202	2,338	2,230	42,052
operating	192	532	854	8,082
Public sector[6]				
capital	23,744	11,124	8,212	239,146
operating	8,324	17,581	27,536	275,529
Total	35,462	31,575	38,832	564,809
Of which: **self financing**[7]				
capital	10,466	7,159	6,095	129,068
operating	2,087	5,236	7,366	75,532
residual, financed from tax base[7]				
capital	13,278	3,965	2,117	110,078
operating	6,237	12,376	20,294	200,772

(1) See table 13.2, Note 2.

(2) 55 percent of "estates" housing expenditure will be in the public sector from 1974 onwards. A broad estimate for "non-estate" housing suggests shares for the public sector as follows: 1975–80, 80%; 1980–85, 75%; 1985–90; 66%. Though some housing, all water and all electricity will be public sector financed initially, it is assumed that in the long term all capital and operating costs will be recovered through housing repayments and consumer charges.

(3) Public finance not recoverable through charges on roads or education.

(4) Capital expenditure on health assumed to be non-recoverable. 50 percent of operating costs assumed covered by hospital charges to patients.

(5) All public sector expenditure. All non-recoverable, except postal services which are assumed to be self-financing in the long-term.

(6) This item covers all public sector activities listed above (see footnotes) for assumptions). It does not, however, represent basic non-recoverable expenditure (see Note 7).

(7) These items provide a breakdown between recoverable and non-recoverable public expenditure. Recoverable operating costs are short-term. Recoverable capital costs may require long-term finance.

CHAPTER 14

Implementation of Development

14. IMPLEMENTATION OF DEVELOPMENT

14.1 Outline of the Development Programme

The proposals for development recommended in this report are brought together in this Chapter to form a structure plan for Trengganu Tengah. The pattern of development proposed up to 1990 is shown in Fig. 14.1. Maximum use is made of the Jerangau – Jabor main road and its feeder roads which will serve the areas of land designated for agricultural development. New towns will be established at strategic locations to accommodate the population working in the agricultural and forestry areas.

In the period up to 1980, the emphasis is on large scale land development for agriculture, forest exploitation on the land to be cleared and in the permanent forests, highway construction and the building of the basic infrastructure and first phases of the new towns. During the 1980's the pace of agricultural land clearance and planting will slow down. Agricultural output will increase as tree crops mature and processing facilities expand. There will be some agricultural land development, however, and it will include a number of projects based on crops other than oil palms and rubber. In the towns the proportion of the population working in the primary sector will decrease and secondary activities will become increasingly important. Facilities for further processing of primary produce from the area will be sited near the towns and it is thought that resource based industry will still dominate the industrial sector in 1990.

The development programme is ambitious but nevertheless practicable. If its basic aims are to be achieved, there must be timely implementation of each sector. This will require considerable effort from the Development Authority and the emphasis should be on co-ordination and co-operation between all the agencies concerned.

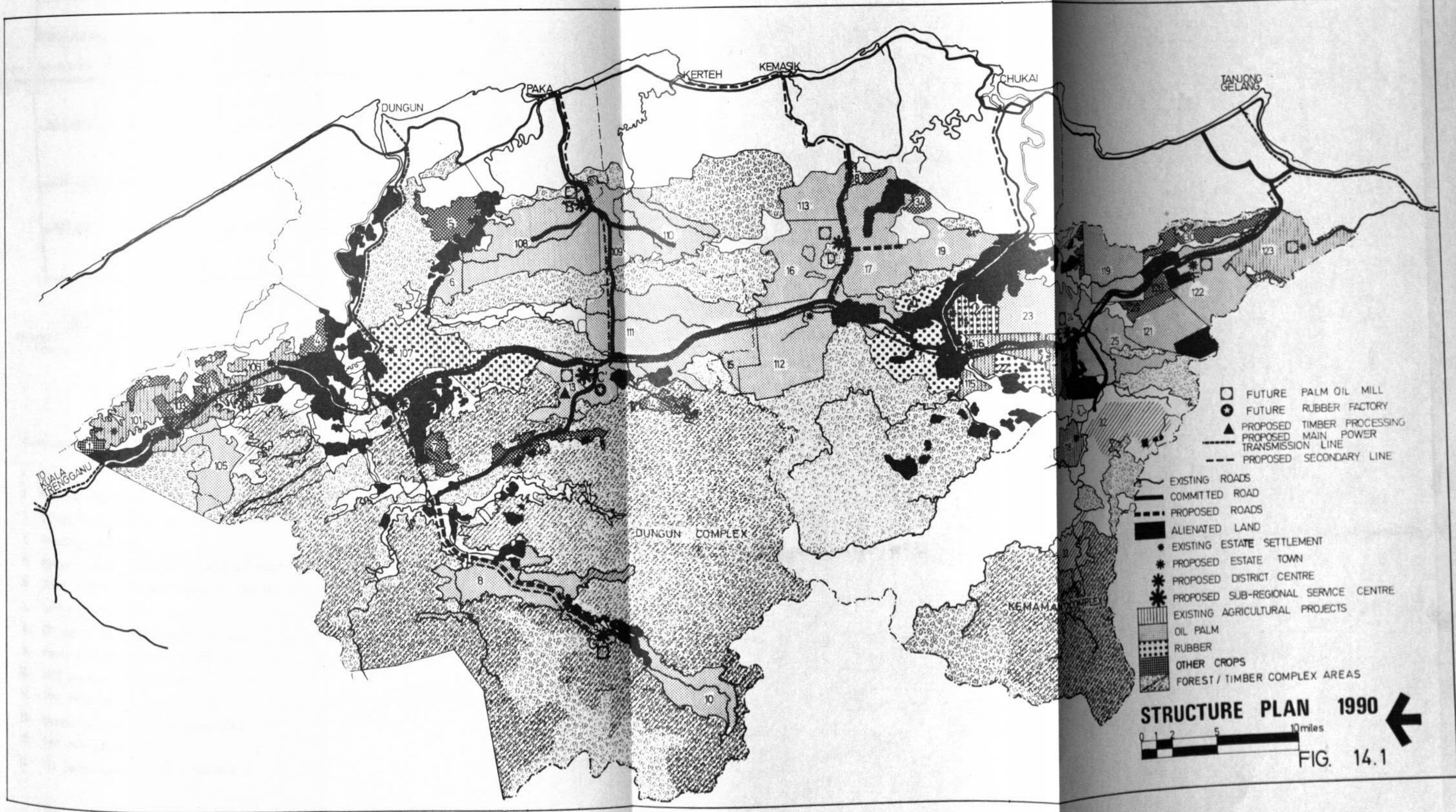
14.2 Components of the Plan

The development programme is composed of a large number of different projects and component activities. Some of these activities are dependent for their initiation on the previous completion of other items although many are effectively independent.

The major activities comprising the total networks of palm oil production and rubber production have been identified and are shown in conventional network diagrams (Figs. 14.2 and 14.3). The activities involved in the commissioning of the timber complex are more usefully shown in chart form, (Fig. 14.4).

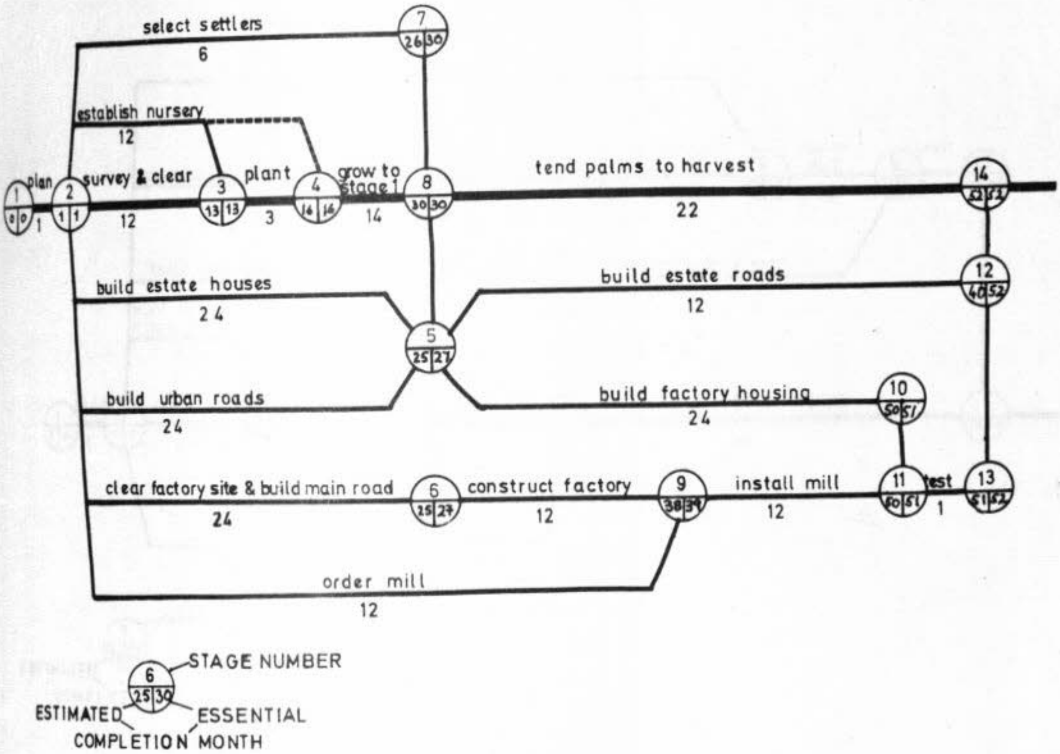
It is apparent that there is a small amount of 'float' or spare time relating to the construction of the main highway and the necessary housing for all three production processes. The critical path as such relates to land clearing and planting. It is also relevant to note that although there is some free time available for completion of the main highway and feeder roads the total is less than one year. Therefore if completion of the roads is delayed by one year or longer there are likely to be losses resulting from delayed transport of ffb to the mills.

The plan of development relating to the whole region is not amenable to conventional critical path analysis as there is no single start or finish point in time. In fact development consists of a large number of on-going schemes and activities which gradually build up in size and number throughout the period to 1990 and continue doing so long after it. This is illustrated in graphic form and discussed in detail in the following section.



DUNGUN
PAKA
KERTEH
KEMASIK
CHUKAI
TANJONG GELANG
TO KUALA TRENGGANU
DUNGUN COMPLEX
KEMAMAN COMPLEX
FUTURE PALM OIL MILL
FUTURE RUBBER FACTORY
PROPOSED TIMBER PROCESSING
PROPOSED MAIN POWER TRANSMISSION LINE
PROPOSED SECONDARY LINE
EXISTING ROADS
COMMITTED ROAD
PROPOSED ROADS
ALIENATED LAND
EXISTING ESTATE SETTLEMENT
PROPOSED ESTATE TOWN
PROPOSED DISTRICT CENTRE
PROPOSED SUB-REGIONAL SERVICE CENTRE
EXISTING AGRICULTURAL PROJECTS
OIL PALM
RUBBER
OTHER CROPS
FOREST / TIMBER COMPLEX AREAS
STRUCTURE PLAN 1990
0 1 2 5 10 miles

FIG. 14.1



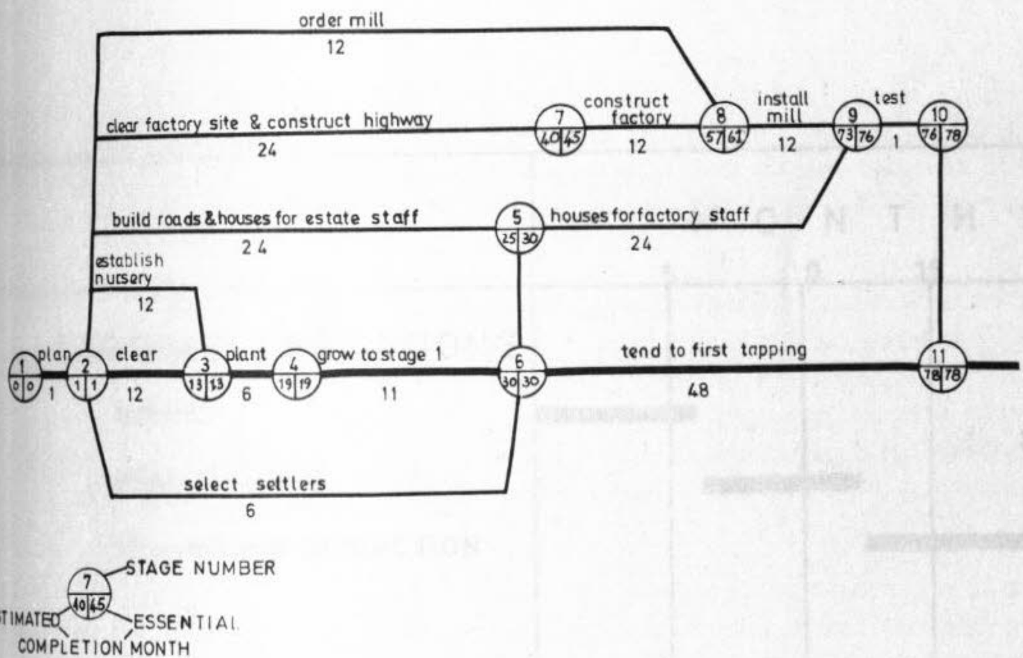
EXPLANATION OF STAGES :

1. Initiate
2. Planning complete
3. Estate cleared and stock ready for planting
4. Planting complete
5. Estate workers housing and related roads built
6. Road to factory constructed and factory site cleared
7. Settlers selected
8. Oil palms grown to stage 1
9. Factory building constructed
10. Mill workers housing built
11. Mill installed
12. Estate harvesting roads completed
13. Mill operational
14. Oil palms ready for first harvest

Note: Number under event line indicates months required for the activity.

PALM OIL PRODUCTION NETWORK

FIG. 14,2



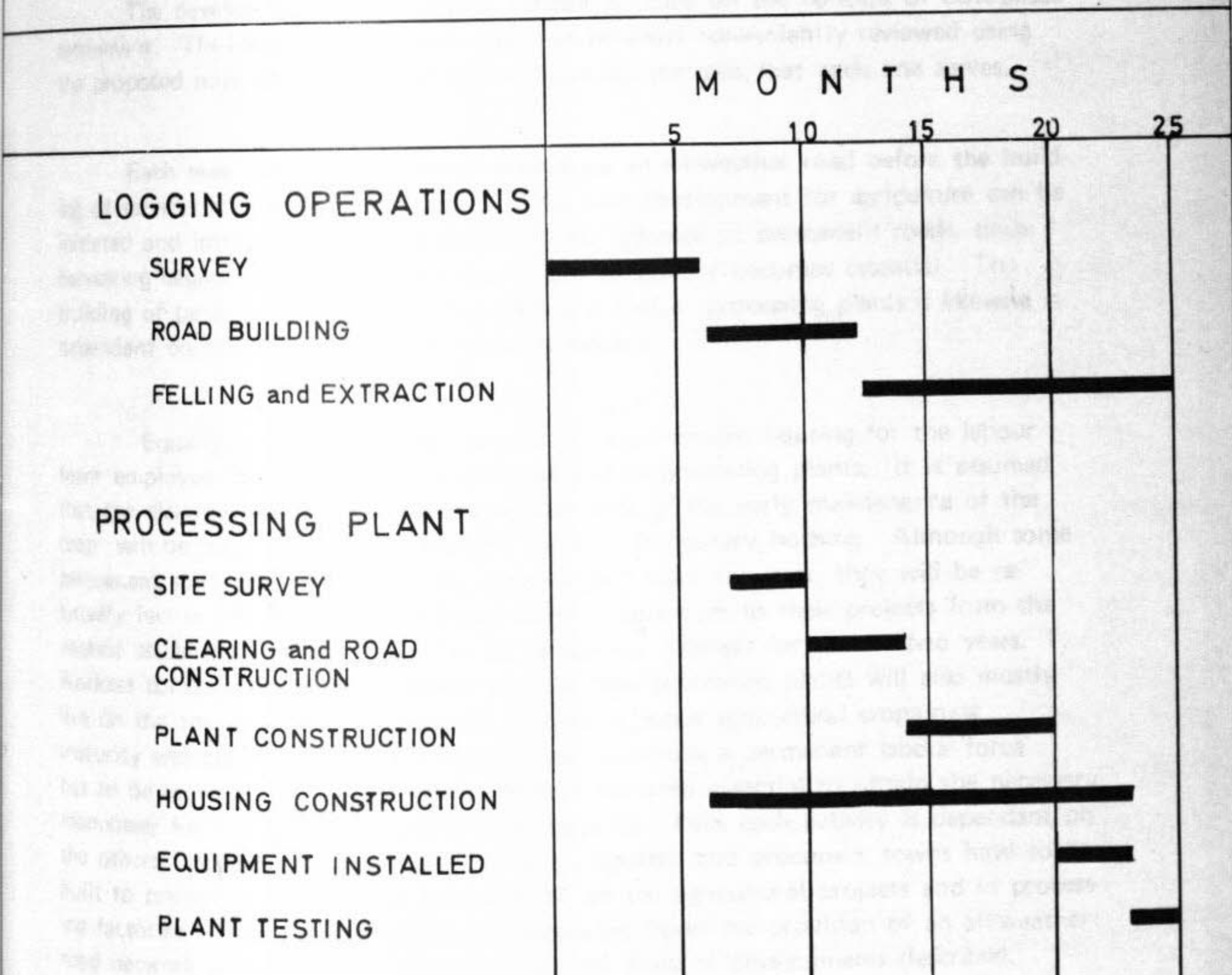
EXPLANATION OF STAGES :

1. Initiate
2. Planning complete
3. Estate cleared and stock ready for planting
4. Planting complete
5. Estate workers housing and related roads built
6. Rubber reaches Stage 1 growth
7. Main highway constructed and factory site cleared
8. Factory building constructed
9. Factory installed and houses ready for factory staff
10. Factory operational
11. Rubber ready for first tapping

Note: Number under event line indicates months required for the activity.

RUBBER PRODUCTION NETWORK

FIG. 14.3



TIMBER COMPLEX PHASING

FIG. 14.4

14.3 Phased Development

14.3.1 Introduction

The development of Trengganu Tengah is based on the concept of centralised settlement. The phased programme can thus be most conveniently reviewed using the proposed new communities as the nucleus for the area that each one serves.

Each new town site has to be served by an all-weather road before the building of services and housing can begin. While land development for agriculture can be initiated and immature crops maintained in the absence of permanent roads, once harvesting begins all-weather access from field to factory becomes essential. The building of palm oil mills, rubber factories and timber processing plants is likewise dependent on the development of the road system.

Equally important is the provision of permanent housing for the labour force employed on the agricultural projects and in processing plants. It is assumed that the clearing of land for agriculture and most of the early maintenance of the crop will be done by contract workers living in temporary housing. Although some permanent staff will be required for each project from the start, they will be relatively few in number, and will either have to commute to their projects from the nearest established settlement or live in temporary quarters for one or two years. Workers constructing the new towns and the new processing plants will also mostly live on the site in temporary quarters. However, once agricultural crops near maturity and processing factories commence operations a permanent labour force has to be recruited. One of the incentives considered essential to obtain the necessary manpower for Trengganu Tengah is good housing. Thus each activity is dependant on the others; agricultural crops have to be transported and processed, towns have to be built to provide homes for the labour force on the agricultural projects and in processing factories. These developments are dependant upon the provision of an all-weather road network which in itself is justified by the scale of developments described.

To put these inter-related activities in graphic form, the Consultants have prepared a series of flow charts (Figs 14a to 14.f) based on the development in each area served by the new towns. The charts show the annual development of each agricultural project from logging prior to land clearance until the total project area is in production. The information on phasing of logging operations, agricultural development by area, crop production and the build up of processing facilities is derived from the relevant tables in Chapters 8 (Tables 8.34 and 8.35), 9 (Tables 9.6 and 9.7) and 10 (Tables 10.6, 10.13 and 10.15). The estimated number of housing starts per year in each community is based on the projections made in Chapter 12 (Tables 12.5a to d).

The critical points at which housing and processing facilities are required are indicated and this is related to the development of the town concerned. The development of processing facilities is illustrated in the same way. The point at which all-weather road access is required is also shown for each project but in every case the earliest requirement is in connection with the town development.

The charts show that logging activity is not likely to impede the agricultural development programme. The critical points are the need, at an early stage, for the roads and housing. In the following sections, the flow chart for each area is discussed and the action priorities are outlined.

14.3.2 Community A (Fig. 14.5a)

Roads

It is proposed that Community A be located at the Bukit Besi mine site which is already served by a metalled road. Development of the main road south to Community C (where the proposed rubber factory will be located) is only critical in 1978.

Town

Community A is classified as an "Estate Town" (Chapter 12). It is to be located at the Bukit Besi mine site serving the existing population there and 40 percent of the labour force working in the northern divisions of the SEDC rubber estate (107). Some housing already exists at Bukit Besi to accommodate the mine workers and additional houses for the estate workers will be needed from 1976 onwards. It is understood that the SEDC has already established one small settlement for its workers on the estate. However, this site is liable to flooding and we recommend that the houses should be relocated in the new Community A. No further housing should be built on the estate.

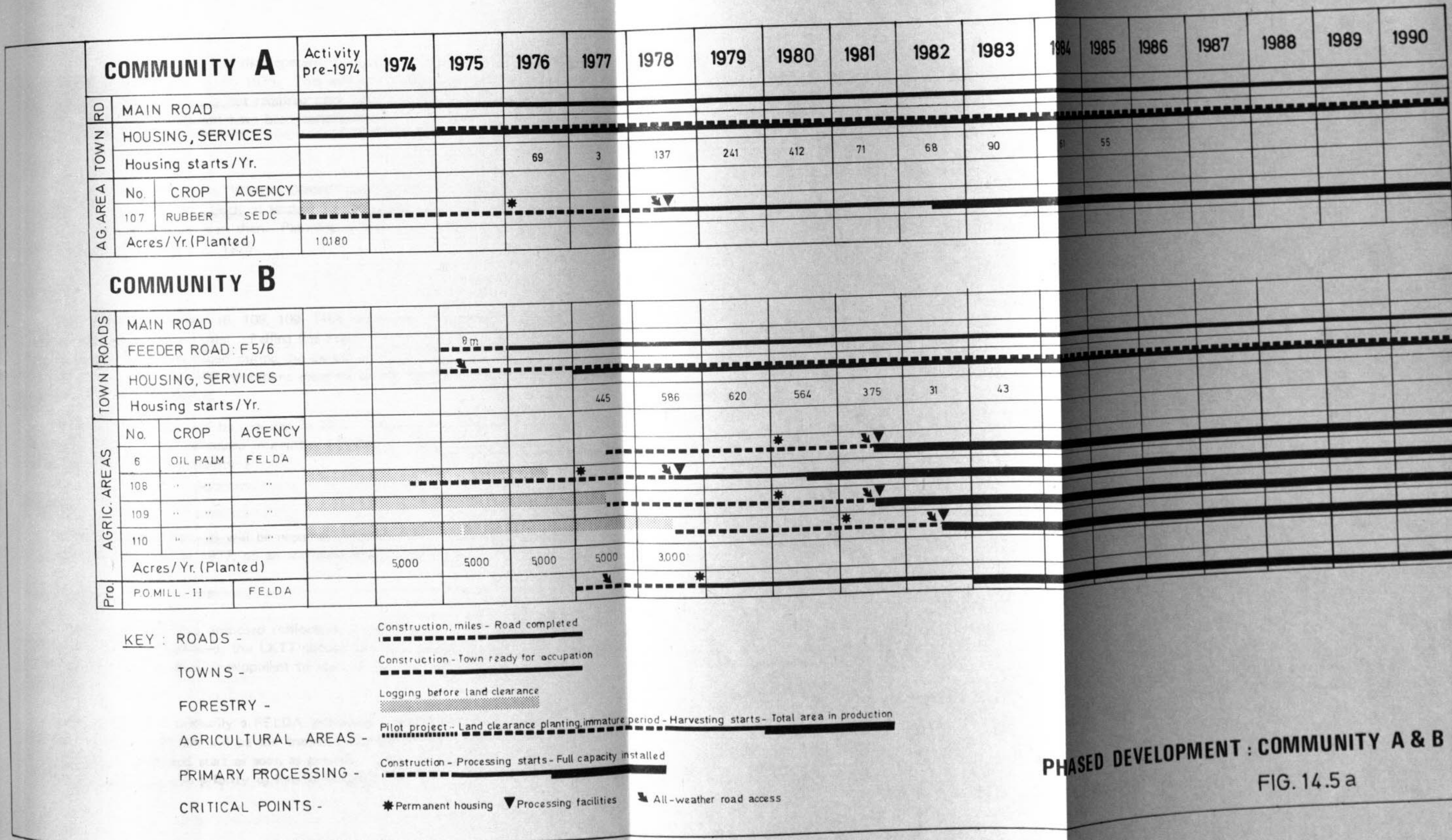
There are already some basic services at Bukit Besi which will have to be supplemented as the population increases.

Agriculture

Only one project is involved, the SEDC Rubber Estate. The northern divisions are already planted and tapping will begin in 1978. The latex will be sent to a new SMR factory located in Community C. By that time, the new main road should be built through the estate thus providing access from field to factory.

Action Required

LKTT should immediately inform the SEDC about this settlement proposal and arrange for the transfer of the present labour lines to Community A. No further housing should be built on the estate. Town Board control must be assumed at Community A and a review of the extent of present facilities should be made. Plans to extend the township should then be drawn up.



PHASED DEVELOPMENT : COMMUNITY A & B

FIG. 14.5 a

14.3.3 Community B (Fig. 14.5a)

Roads

In order to allow township development to begin in 1975, 8 miles of Feeder Road F5/6 must be constructed in 1975. This will provide access to the site from Paka. Field to factory access is not required until 1978, by which time internal Feeder Roads F3 and F4 should have been constructed.

Town

Community B is to be a "District Centre" based on the FELDA Rasau-Kerteh settlement scheme. The first batch of settlers are scheduled to enter the scheme in 1977 and houses will be required then. Planning of this town should start immediately and construction must begin in 1975.

Agriculture

Four areas are involved (6, 108, 109, 110) but they are consolidated into one settlement scheme under oil palm. Felling has begun (1974) in Area 108. The remaining areas will be developed during the period to 1978. Logging is not foreseen as a constraint but in Area 108 operations must be closely monitored to ensure timely release of the land for clearing.

Processing facilities will be required in 1979. The initial crop harvested from Area 108 in 1978 can be processed in another FELDA mill either at Jerangau (Community H) or at Community F.

Processing

A palm oil mill (No. II) will be required in 1979. Site clearance and construction must therefore start in 1977, on an approved site in Community B.

Action Required

The Consultants have proposed reallocation of the land in Areas 109 and 110 to FELDA. If this is approved, the LKTT should take the necessary steps to implement the transfer in time to allow development to start in 1977 in Area 109 and 1978 in Area 110.

Community B is primarily a FELDA settlement. While all plans must be approved by LKTT, FELDA will be the implementing agency for the town. Site survey and planning should start as soon as possible. LKTT should direct the road construction agency to give priority to Feeder Roads F5/6.

14.3.4 Community C (Fig. 14.5b)

Roads

Site clearance for the town at Community C must begin in 1975. Road access is thus required in that year. This involves the construction of Feeder Road F5/6 (17 miles) and construction of three miles of the Main Road north from its junction with F5/6. By 1978, a further 19 miles of the Main Road will be required north and south of the town to serve the agricultural projects. Construction of Feeder Road F 1/2 does not become essential until the early 1980's but development of the area will undoubtedly be made easier by earlier completion of the complete road system.

Town

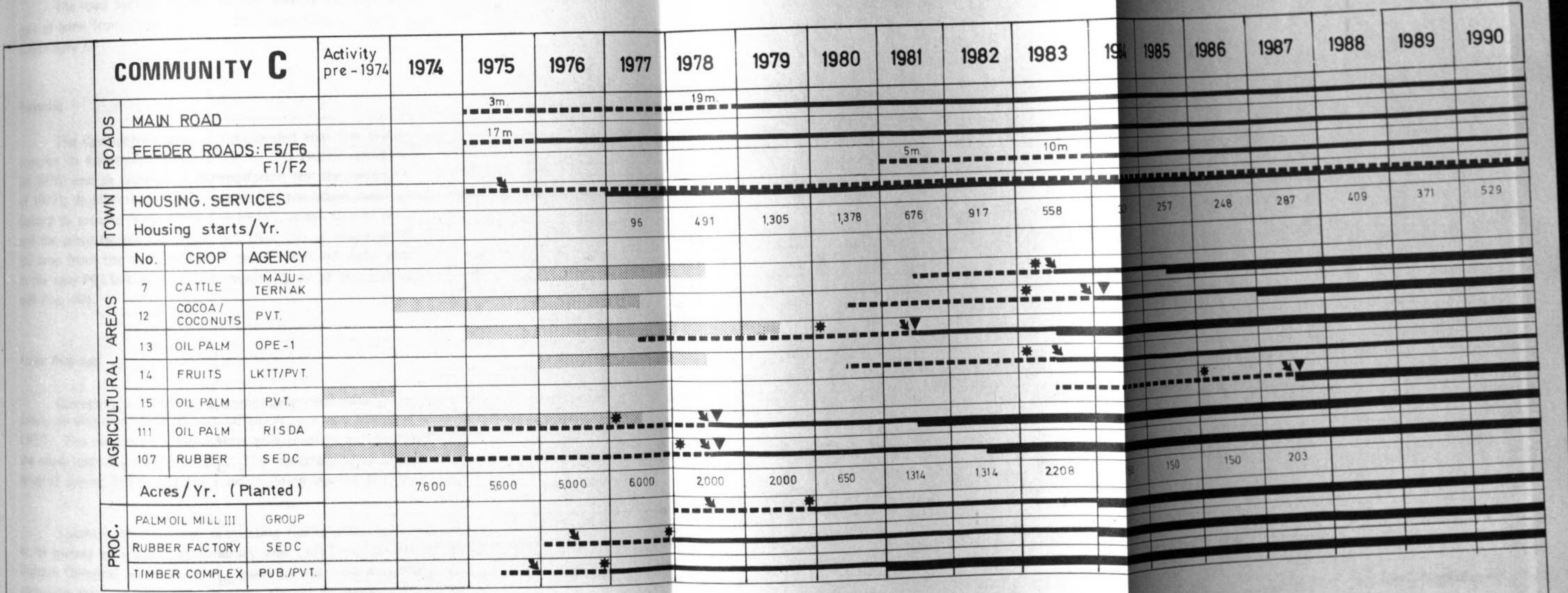
Community C is to be the largest town in Trengganu Tengah and will be the Sub-Regional Service Centre. It will serve a number of agricultural projects and will also be the site of a palm oil mill (No. III) the SEDC rubber factory and the Dungun wood-based industries complex.

The first requirement for housing will be for the permanent workers at the timber complex, the RISDA oil palm estate (Area III), the palm oil mill and the Bukit Besi rubber estate (107). In 1977 and 1978 the number of houses is relatively small and temporary services would suffice but from 1979 on, the population increases rapidly and planning and infrastructure development must keep pace with the demands upon it.

Agriculture

Seven projects are involved, two of which are already being developed. These are the RISDA oil palm estate (Area III) and the southern divisions of the SEDC Bukit Besi rubber estate (107). By 1982, 60 percent of the work-force on the latter project will be accommodated in Community C. A new oil palm estate, OPE – I (Area 13) will be started in 1977 and the remaining projects, which will mainly be in diversified crops, will be developed from 1980.

Logging activitiy is not foreseen as a constraint to development but operation in Areas 13 (OPE – I) and III (RISDA Oil Palm Estate) must be monitered closely to ensure timely release of the land for clearance. Areas 7 and 12 are within the Dungun timber complex area and arrangements should be made for their early exploitation and subsequent release prior to development.



PHASED DEVELOPMENT : COMMUNITY C

FIG. 14.5 b

The road system should be sufficiently developed by 1978 to enable transport of latex from Area 107 and ffb from Area III to the processing facilities at Community C.

Processing

The Consultants have recommended that the Dungun wood-based industries complex be located at Community C. To enable construction to commence on time (in 1975) and to provide accommodation for the permanent work-force (at the end of 1977), development of the roads and the town must be on time. The rubber factory to process latex from the SEDC estate should be ready by the end of 1977 and the group-owned palm oil mill (No. III) is required by 1980. In 1978 – 79, the crop from the first phases of the RISDA oil palm estate (III) can be processed in the new FELDA mill at Community B or at the existing NADEFINCO palm oil mill (No. IV).

Action Required

Community C will be a completely new town in an undeveloped area. Its timely development will be looked upon as a confirmation of the capabilities of the LKTT. The Authority should thus give priority to the planning and construction of the town with immediate effect. The necessary road links to the site must be constructed during 1975 and the road building agency should be so instructed.

Location of the three processing facilities in Community C is considered vital to its success as a viable community and LKTT should inform the SEDC and the Dungun Complex agencies of the need to site their processing facilities there. To encourage this, realistic commitments should be made with regard to provision of housing and services for the industrial sector and a suitable site for the resource based processing industries must be selected and prepared early in 1975.

14.3.5 Community D (Fig. 14.5c)

Roads

Road access to the town site will be required in 1976. This will involve the construction of six miles of Feeder Road F7/8 westwards from its junction with the existing Kemasik – Ayer Jerneh – Kijal road. Completion of the Feeder Road in 1977 would be desirable to provide a link with the new Main Road. Feeder Road F/10, south from Community D will be required by 1978 at which time ffb from the oil palm estates OPE – 2 and OPE – 4 will have to be transported to processing facilities. This will most likely involve the Main Road too and it is assumed that this will be completed by 1978.

Town

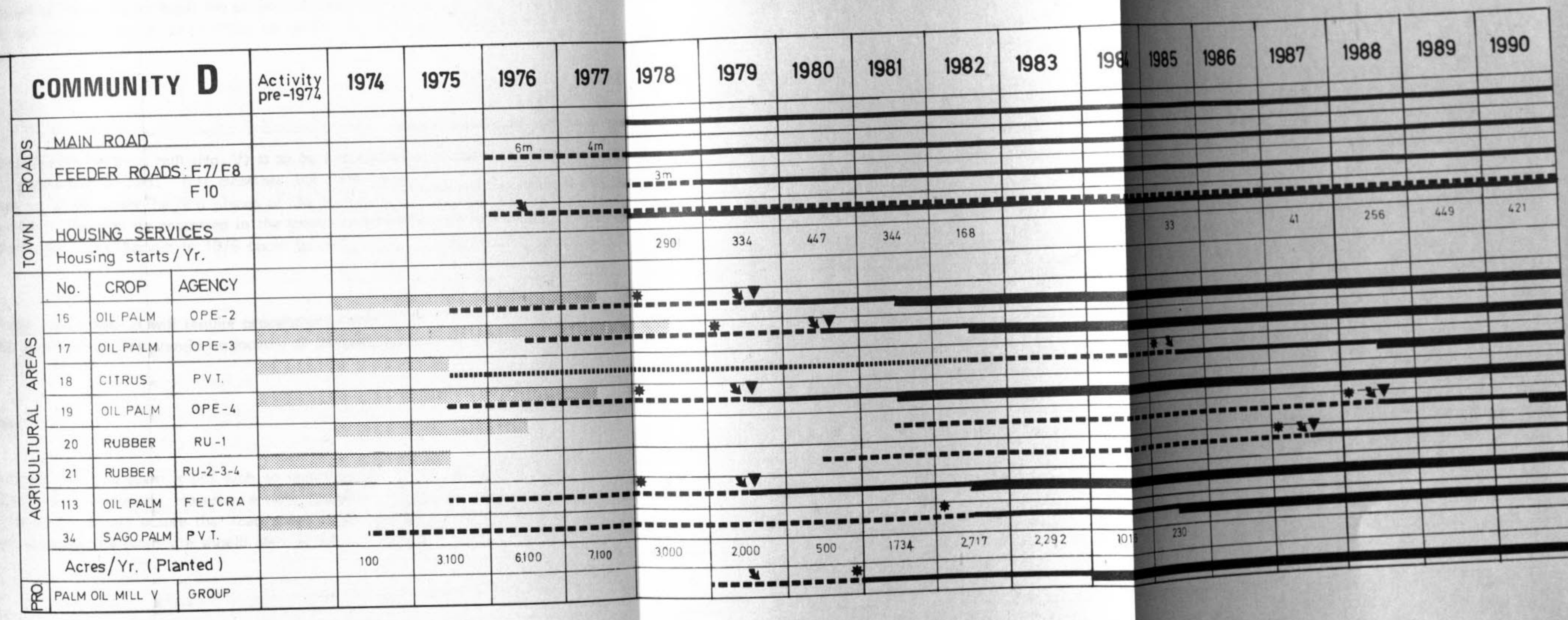
Community D is to be a "District Centre" level of settlement. Housing is first required in 1978 to serve the permanent labour force of the oil palm estates OPE – 2 (Area 16), OPE – 4 (19) and the FELCRA Youth Scheme (113). Town development should thus commence in 1976. In projecting the number of houses required in this town the Consultants have assumed that the youths on the FELCRA scheme will be accommodated in the town from 1978. This conflicts with the pioneering concept associated with the Youth Schemes but some compromise will have to be reached if the settlement pattern objectives are to be realised. For instance, the youths could stay on the project until they marry and could then take up residence in the town.

Agriculture

Eight projects are involved including four oil palm projects which will start in 1975/76. The remaining projects, which will be developed during the 1980's, include four new rubber estates on Areas 20 and 21 and a citrus estate on Area 18. The latter will be preceded by a pilot project which should be started as soon as possible.

The sago project which is to be started in 1974 (Area 34) will initially employ only a few people and provision of accommodation for them will not be a critical factor.

Logging of areas before land clearance is not a constraint using the phasing proposed. However, this does depend on the timely implementation of logging in Areas 16, 17 and 19 which are the sites of the three oil palm estates OPE – 2, OPE – 3 and OPE – 4.



PHASED DEVELOPMENT : COMMUNITY D

FIG. 14.5 c

Transport of ffb or latex from the projects in this area to processing facilities in the towns will not be required until 1979, by which time the road system should be completed.

Processing

A group-owned palm oil mill (No. V) is to be constructed in Community D to come into production in 1981. Site clearance and construction should begin in 1979. Harvesting of ffb from the first phases of the four oil palm schemes will start in late 1979. This can be processed in the group-owned mill at Community E during 1980 and the initial harvest in 1979 could be sent to the existing NADEFINCO mill.

The new rubber estates will require processing facilities from 1987 and it is proposed that a rubber factory should be located at Community E.

Action Required

The building of this town is not such an urgent matter as the construction of the towns previously mentioned. However, a tight schedule of implementation must be observed. The LKTT should ensure that road access to the site is available in 1976. Planning and surveying the town site should start as soon as possible.

14.3.6 Community E (Fig. 14.5d)

Roads

Access to the town site must be provided during 1975 if construction of the town is to begin on time. This will involve the building of some 18 miles of the Main Road north from its proposed connection with the existing road system at Tanjong Gelang. A further nine miles of the Main Road north of Community E to join the existing Chukai – Ayer Puteh road should be constructed in 1977 to provide access to processing facilities for the agricultural projects in the area. The Feeder Road F9 could be constructed as late as 1979 when the new oil palm estates OPE – 6 and OPE – 7 will start producing ffb.

Town

Community E is to be a "District Centre" level of settlement. The need to start its development immediately is dictated by the demands of two projects proposed to start in 1974, the oil palm estate (119) and the annual crop project (120). Only III houses will be required for those projects in 1977 but if the concept of centralised settlement is to be supported it is felt necessary to make timely provision for the needs of the projects to be served.

Agriculture

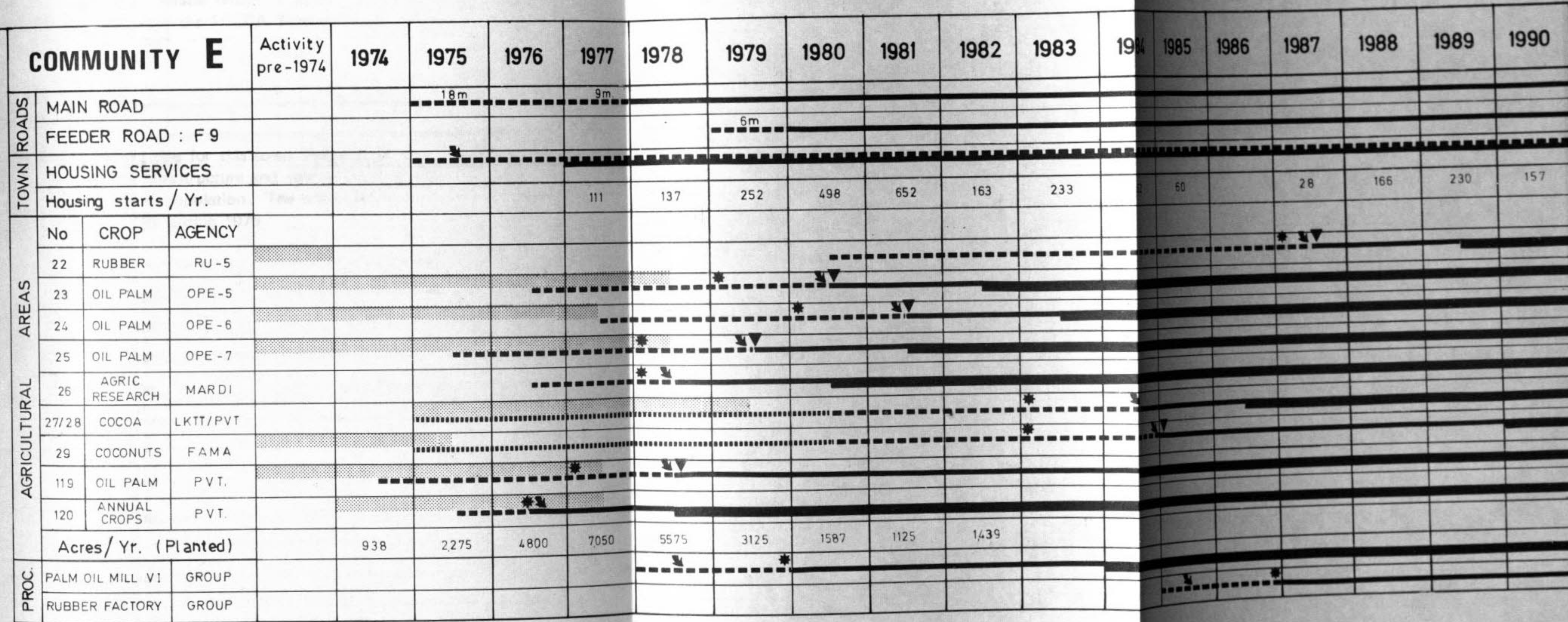
Nine projects are involved comprising four oil palm estates, (OPE – 5, 6 and 7 and Ladang Tenggara, 119), a rubber estate (RU – 5), three diversified agriculture projects and a new research station for MARDI. Two of the diversified agriculture projects on cocoa and coconuts respectively will be preceded by pilot projects which should be initiated as soon as possible.

Logging before land clearance is not foreseen as a constraint to development but timely release of land must be ensured particularly when logging and development are closely phased in Areas 23, 25 and 119.

Transportation of ffb from the oil palm estates to the mill will not start until 1978 by which time the road system should be completed.

Processing

A group-owned palm oil mill (No. VI) is to be built at Community E. Construction should start in 1978 and production is timed to start in 1980. The small quantity of ffb harvested from the first phase of Ladang Tenggara during 1978/79 can be processed at the FELDA mill at Community E.



PHASED DEVELOPMENT : COMMUNITY E

FIG. 14.5d

During the 1980's, a rubber factory will be built at Community E to process latex from the five new rubber estates (RU – 1 to 5). It could also take latex from smallholders in the area and from the FELDA Seberang Tayor scheme. Production should be timed to start by 1987.

Action Required

LKTT should start planning for this town immediately but its relatively modest rate of growth should enable infrastructure and services to be provided at levels adequate to accommodate the increase in population. The critical factor will be construction of the Main Road to the town site during 1975.

14.3.7 Community F (Fig. 14.5e)

Roads

Access to the town site is required in 1975 to enable a start to be made on building the town and a new palm oil mill. This will involve the construction of about eight miles of the Main Road from its southern end at Tanjong Gelang. The road will also be required to provide access to Community E as described in 14.3.6 above.

Town

Community F will be an "Estate Town" level of settlement serving the settlers on the two FELDA schemes Neram I (Area 122) and Neram II (Area 121). These schemes are already being developed and settlers are scheduled to come into Neram I during 1975. This sets an almost impossible deadline for housing construction and it seems likely that settlement may have to be postponed until 1976. It is essential, therefore, that work on this town is started as soon as possible. After 1980, it is proposed that the FELDA settlers will be joined in the town by workers from two other projects. The town plan will thus have to make provision for the housing of non-FELDA agricultural workers from 1982. The principal implementing agency for Community F will be FELDA, whose plans should include provision for the participation of other agencies at a later date.

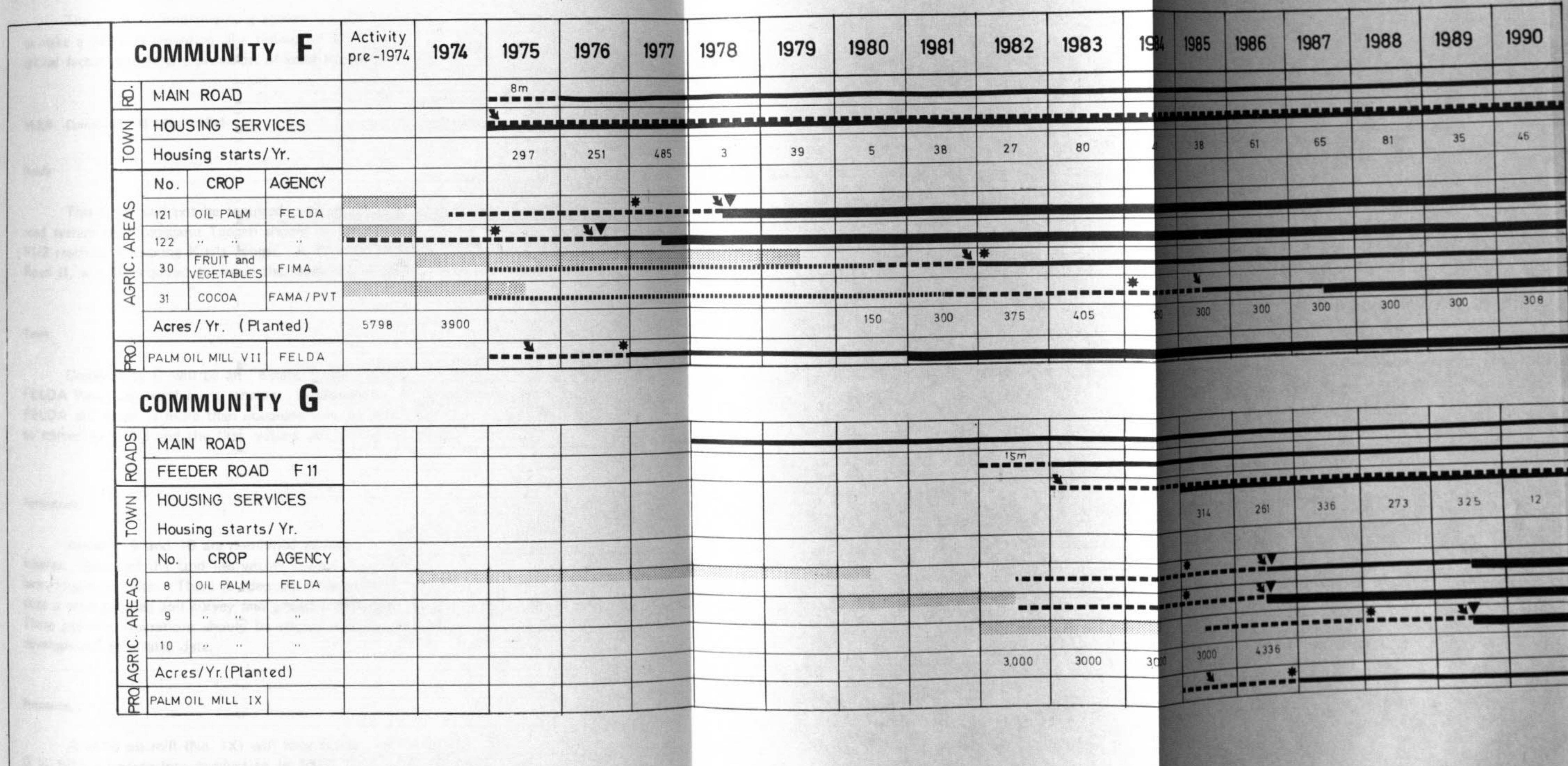
Agriculture

Four projects are involved but the two comprising the FELDA Neram Settlement Scheme make up most of the area. These two are already being developed and harvesting will start on Neram I (Area 122) in 1976. Two pilot projects on fruit and vegetables and cocoa are proposed on Areas 30 and 31 respectively. These should be initiated as soon as possible.

Logging on the FELDA areas is completed. It will not be a constraint on the two other areas which will be developed from 1980.

Processing

FELDA have firm plans to build a palm oil mill (No. VII) at Community F to serve the Neram schemes and some others in Pahang. Construction should start in 1975 and production in 1977.



PHASED DEVELOPMENT : COMMUNITY F & G

FIG. 14.5 e

Action Required

The principal implementing agency for this town will be FELDA who will have to make a decision regarding the timing of settlement of the Neram I scheme. A critical factor will be the provision of road access to the site in 1975.

14.3.8 Community G (Fig. 14.5e)

Roads

This town will not be required until after 1980 by which time the proposed road system for Trengganu Tengah should be almost complete including Feeder Road F1/2 reaching Kampung Kuala Jengai. A 15 mile extension of this road, Feeder Road II, will be required to reach the town site in 1982.

Town

Community G will be an "Estate Town" level of settlement serving the proposed FELDA Pasir Raja settlement scheme. Implementation will be the responsibility of FELDA and there is more than adequate time to plan the town. Construction should be started by 1983 and the first settlers will be housed in 1985.

Agriculture

Areas 8, 9 and 10 are combined to make a 16,000 acre oil palm settlement scheme. Some of the land lies within the Dungun complex area and little of it has been logged to date. There is adequate time available to demarcate boundaries, conduct a semi-detailed soil survey and programme forest exploitation prior to clearing. These planning operations should be started soon to enable a smooth implementation of development at a later date.

Processing

A palm oil mill (No. IX) will have to be constructed by FELDA at Community G in 1985 to come into production in 1987. The small quantity of ffb expected in 1986 from Areas 8 and 9 could be processed at the group owned mill (No. III) at Community C.

Action Required

Immediate action on this project is not required but planning should be started by both FELDA and LKTT. Access to the site will require a road crossing of the Sungei Dungun and plans of this and the Feeder Road FII should be prepared in good time.

14.3.9 Community H (Fig. 14.5f)

Roads

Community H is already served by the existing Ajil – Dungun road.

Town

Community H, which presently exists as the FELDA Jerangau scheme village will be expanded to "Estate Town" level by the addition of housing and services for the settlers on Jerangau Barat scheme (105). Additional population will come in the 1980's when the four small diversification projects are implemented in Areas 1, 2, 3 and 4. The town is under FELDA control and the settlers for Jerangau Barat are due to enter the scheme in 1976. An immediate start must therefore be made to expand the existing settlement and build the 214 new houses required in 1976.

Agriculture

Five project areas are involved. The Jerangau Barat settlement scheme (105) is already planted. Two pilot projects are recommended for Areas 1 and 3 on coconuts and fruits respectively. These should be started as soon as possible.

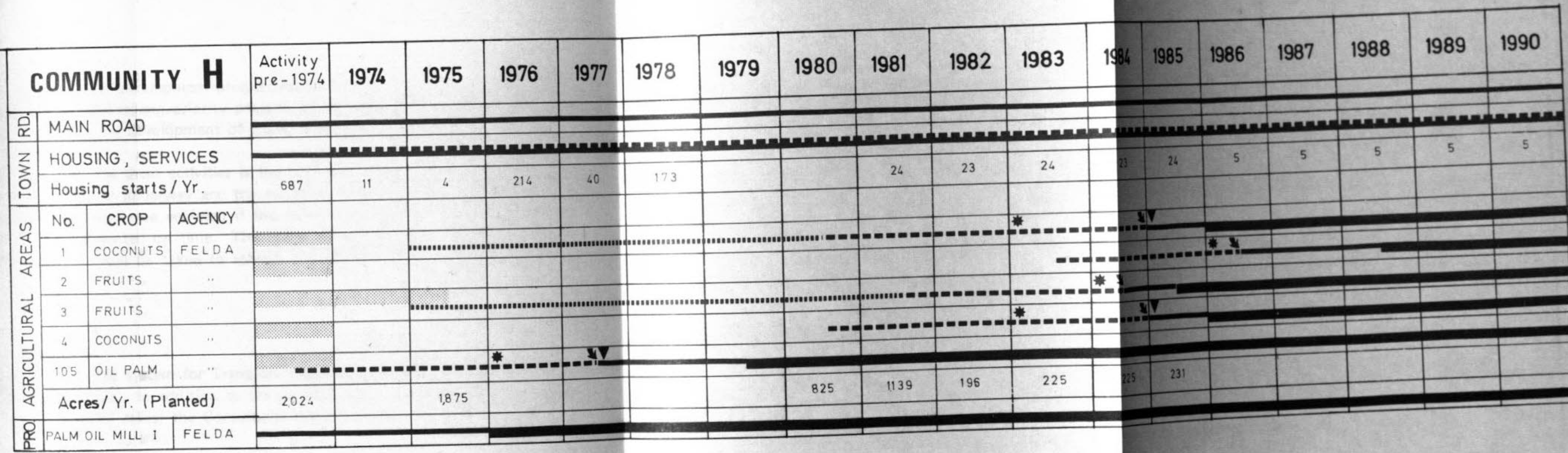
Logging activity on the development areas is virtually finished. The existing road system is adequate to meet foreseeable needs.

Processing

FELDA has a palm oil mill (No. 1) at Jerangau. Its capacity will be expanded to meet the additional throughput from the Jerangau Barat scheme.

Action Required

FELDA should be requested to draw up plans for extending their present village at Jerangau. Construction of new houses should commence early in 1975.



PHASED DEVELOPMENT : COMMUNITY H

FIG. 14.5 f

14.4 Priority Projects

14.4.1 Introduction

The review of the development programme by Community area in the previous section, highlights the immediate priority projects which are vital to the structure plan as a whole. These are the development of roads, towns and processing facilities.

While the basis for these activities is the land development and forestry programme, these are already underway and the successful development of Trengganu Tengah as a whole will only be achieved if the three components of the plan mentioned above are implemented on time. The following sections are concerned mainly with the action which must be taken to achieve this between the present time and 1980.

14.4.2 Roads

The proposed road system for Trengganu Tengah has been described in some detail already (Chapter 6). In addition to the Jerangau-Jabor Main Road (65 miles) and its Feeder Roads (57 miles) the Consultants have proposed an additional 18 miles of feeder roads (Chapter 13).

] The detailed survey and design study [52] of the Jerangau Jabor road is completed. Tender documents are being prepared and, if agreement can be reached on the financing, construction could begin in 1975. It is important to bear in mind that the monsoon rains virtually preclude construction work in Trengganu Tengah for four months (November – February) of the year. Every effort should thus be made to start construction as soon as possible in 1975.

The phased development programme indicates that certain sections of the road system are vital to the development programme at an early stage. Other sections need not be completed until 1978 or later (Fig. 14.6). Thus in 1975 a total of 21 miles of the main road must be constructed to provide access to Communities C, E and F. In the same year Feeder Road F5/6 (17 miles) must be constructed to provide access to Communities B and C. In 1976, 6 miles of Feeder Road 7/8 is needed to provide access to Community D and in 1977 a further nine miles of Main Road and four miles of Feeder areas. From 1978 onwards, the remaining roads will be constructed to link all the communities and to provide a main trunk road from Kuala Trengganu to Tanjong Gelang (Table 14.1).

Fig. 14.6 and Table 14.1 outline the priorities. They should not be taken as a recommendation that the road programme should be slowed down from its present proposed pace. The new roads will benefit, not only Trengganu Tengah but other areas as well and in the case of the main road, the effect of early linking of the new communities is undoubtedly important. The critical point is the need for the roads in 1975 and if this can be achieved the road programme should proceed satisfactorily thereafter.

Table 14.1 Trengganu Tengah: Road Construction Programme

Mileage required in:	1975	1976	1977	1978–80	1980+	Total
			Miles			
Main Road	21			44		65
Feeders Roads						
F1/2					15	15
F3/4				9		9
F5/6	17					17
F7/8		6	4			10
F9				6		6
F10				3		3
F11					15	15
TOTAL/YEAR	38	6	4	62	30	140

14.4.3 Town Development

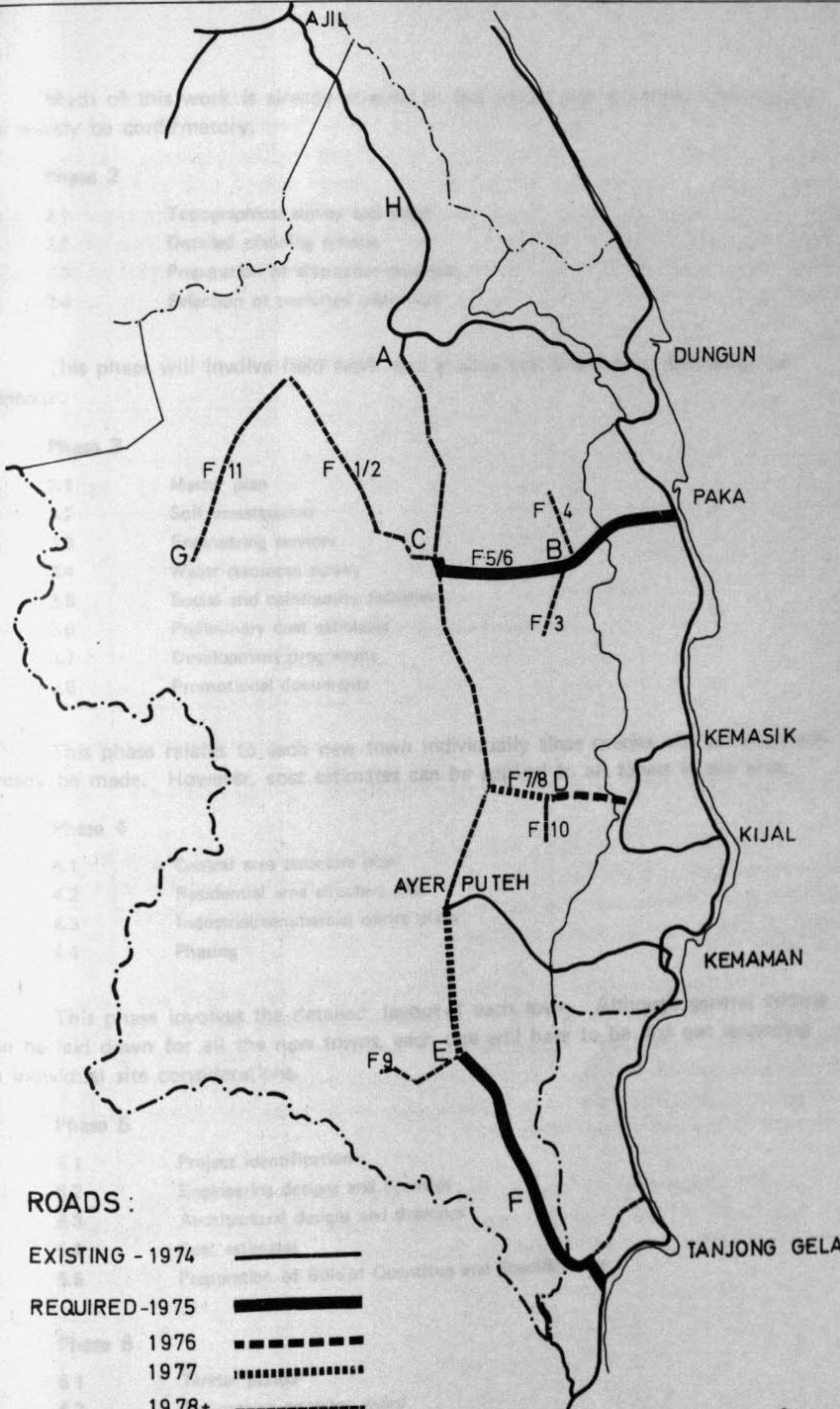
Timely development of the new communities is seen as vital to the overall success of Trengganu Tengah as a socio-economic development. Only two of the eight communities proposed for the settlement pattern have any physical existence at present; those at Jerangau (Community H) and Bukit Besi (Community A). The other six communities have to be developed from scratch.

The first priority, therefore, is the preparation of a Master Plan for the design, survey and construction of the new communities, B, C, D, E and F. Community G is not required until after 1980 and can be planned at a later date.

Six phases have been identified in the process of preparing a Master Plan of the kind required in Trengganu Tengah. These are:—

Phase 1

1.1 Economic basis and population statistics
1.2 Locational requirements
1.3 Regional or sub-regional context
1.4 Settlement pattern
1.5 Regional communications network
1.6 Regional infrastructure
1.7 Site selection



ROAD DEVELOPMENT

FIG. 14.6

Much of this work is already covered in this report and the Master Plan Study will merely be confirmatory.

Phase 2

2.1	Topographical survey and maps
2.2	Detailed planning criteria
2.3	Preparation of alternative concepts
2.4	Selection of preferred alternative

This phase will involve field work and is thus best undertaken following the monsoon.

Phase 3

3.1	Master plan
3.2	Soil investigation
3.3	Engineering services
3.4	Water resources survey
3.5	Social and community facilities
3.6	Preliminary cost estimates
3.7	Development programme
3.8	Promotional documents

This phase relates to each new town individually since precise site selection will already be made. However, cost estimates can be applied to all towns in the area.

Phase 4

4.1	Central area structure plan
4.2	Residential area structure plan
4.3	Industrial/commercial centre plans
4.4	Phasing

This phase involves the detailed layout of each town. Although general criteria can be laid down for all the new towns, each one will have to be laid out according to individual site considerations.

Phase 5

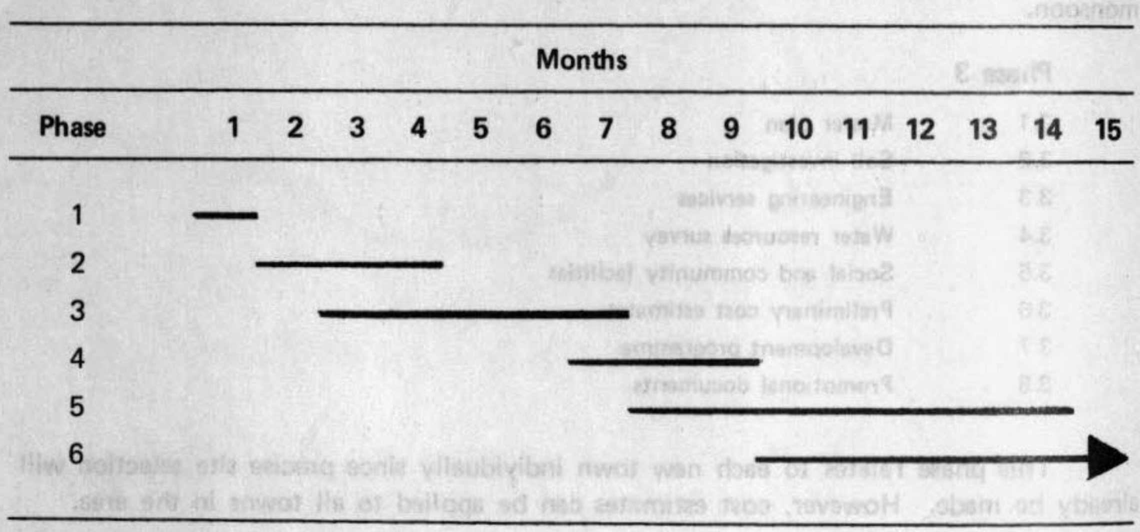
5.1	Project identification
5.2	Engineering designs and drawings
5.3	Architectural designs and drawings
5.4	Cost estimates
5.5	Preparation of Bills of Quantities and Specifications

Phase 6

6.1	Tender period
6.2	Engineering contract award
6.3	Building contract award
6.4	Implementation and supervision

A management group should be set up to promote the new towns, attract investment and co-ordinate development (New Towns Corporation) ideally to commence with Phase 4 and to run on concurrently through the remaining phases. However, if a town is based on one primary activity using a national agency such as FELDA then the management group for it should be set up right at the start of the planning stage. This will apply in the case of Communities B and F. The remaining new towns will be the general responsibility of LKTT, who will also have overall jurisdiction of all urban development planning.

Table 14.2 Timing of Master Plan Study



The timing of the Master Plan Study suggested (Table 14.2) shows that construction (latter part of Phase 6) could begin about twelve months from the start of the study. Town development is a continuous process and in practice, Phase 6 will continue indefinitely as the town grows.

With the aim of starting the Master Plan study early in 1975 and starting construction early in 1976, the LKTT should take immediate action to commission the study. Terms of Reference should be drawn up and if, as seems likely, consultants are to be employed, invitations to submit proposals should be made. The objective should be to have the planners in the area early in 1975 so that on-site investigations can start at the end of the monsoon.

The critical need for housing the permanent labour force of projects from 1976 on will impose a tight schedule on operations although the number of housing units required initially is not overwhelmingly large (Table 14.3).

Table 14.3 Trengganu Tengah: Annual Housing Starts Required

Community	1975	1976	1977	1978	1979	1980	1981–1990	Total
A		69	3	137	241	412	345	1,207
B			445	586	620	564	449	2,664
C			96	491	1,305	1,378	4,595	7,865
D				290	334	447	1,712	2,783
E			111	137	252	498	1,751	2,749
F	297	251	485	3	39	5	512	1,592
G							1,521	1,521
H [1]	4	214	40	173			143	574
TOTAL	301	534	1,180	1,817	2,791	3,304	11,028	20,955

[1] 698 houses already built at end 1974.

Basic services will have to be provided as soon as the new houses are built. In the long term, the main transmission line from Kuantan to Kuala Trengganu across Trengganu Tengah will supply electricity to the towns in the development area. Until this line is built, however, temporary arrangements will have to be made to supply power for household and public area use and it is recommended that the LLN could do this by installing portable diesel generating sets in each new community. The communities in which palm oil mills are to be constructed may be able to draw some of their power requirements from the mills. But this source will either be unavailable or inadequate during the early years.

Water supply will ultimately come from a series of installations serving each town. However, it may be necessary to install temporary waterworks systems while the permanent system is under construction.

The provision of other infrastructure has been outlined in Chapter 13 and need not be repeated here. However, the timely provision of this infrastructure will be vital to the early viability of the new communities and their ability to attract immigrants.

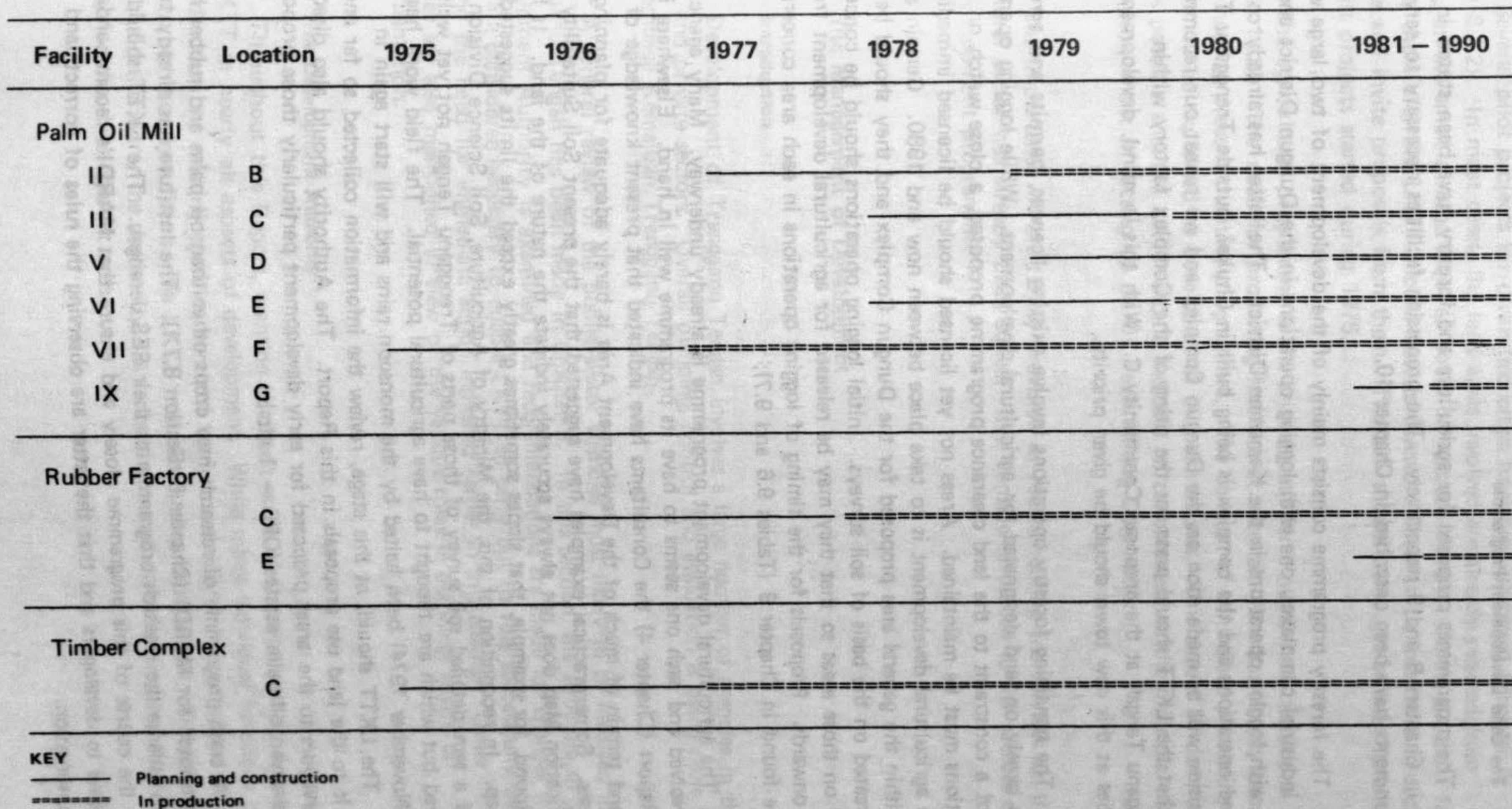
14.4.4 Processing Facilities

The importance of processing agricultural and forestry produce within the area has already been described in Chapter 10. The location of processing facilities in the new towns is considered to be vital to their success as viable units (Table 14.4).

The concept of centralised processing of palm oil and the possibilities for further processing have been discussed in Chapter 10 and Terms of Reference for a feasibility study of this aspect have been prepared (Appendix F.1). It is strongly recommended that the study should be carried out by a suitably qualified team as soon as possible. The location, construction and phasing of capacity of the proposed palm oil mills described in Chapter 10 is dependent on the adoption of the centralised milling concept. Whatever final decision is made, it is necessary to inform all developers of oil palm schemes of the arrangements for processing their fruit. If the centralised processing concept is adopted, the LKTT, through its interest in the proposed oil palm milling corporation will have to initiate the planning and development of the three group-owned mills (Nos. III, V and VI). The other major palm oil mills (Nos. II, VII and IX) are the responsibility of FELDA.

Proposals for two rubber factories, one to serve the SEDC Bukit Besi Rubber Estate, the other to serve new rubber estates to be developed in the 1980's, have been described in Chapter 10. The LKTT should inform the SEDC, immediately, of the need to site their rubber factory in Community C. An early decision to site the Dungun wood-based industrial complex at Community C is also required. Development of the industrial site at Community C is a priority project.

Table 14.4 Trengganu Tengah: Development of Primary Processing Facilities



14.4.5 The Land Development Programme

The programmes proposed for agriculture and forestry have been stated in some detail in Chapters 8 and 9 respectively. The processing facilities necessary to serve these developments have been described in Chapter 10.

The forestry programme consists mainly of the development of two large wood-based industrial complexes, one with logging operations in the Dungun District and the other with logging operations in the Kemaman District. The latter has already commenced operations and the complex is being built in Chukai, outside Trengganu Tengah. A decision will be made soon on the Dungun Complex and we repeat our recommendation that the LKTT should press for the siting of the Complex factory within Trengganu Tengah at the proposed Community C. With this in mind, development of facilities at this new town should be given priority.

The remaining forestry operations involve existing licences, permits and agreements largely on land designated for agricultural development. While logging operations are not a constraint to the land clearance programme proposed, a close watch on operations must be maintained. Areas not yet licensed should be licensed immediately where agricultural development is to take place between now and 1980. Certain areas are within the general area proposed for the Dungun Complex and they should be demarcated on the basis of soil surveys. Initial logging operations should be concentrated on those areas so that they may be released for agricultural development from 1980 onwards. Proposals for the timing of logging operations in each area concerned will be found in Chapter 9 (Tables 9.6 and 9.7).

The agricultural development programme is already underway. Many agencies are involved and each one seems to have its programme well in hand. Elsewhere in this Report (Chapter 4) the Consultants have indicated that present knowledge of the soils and terrain of much of the Development Area is barely adequate for planning purposes. Some practical examples have suggested that the present Soil Suitability Classification Map does not always accurately indicate the nature of the land. It has been found, for example, that slopes sometimes greatly exceed the limits suggested by the map. In recognition of this, the Ministry of Agriculture, Soil Science Division has started a semi-detailed soil survey of those parts of Trengganu Tengah not yet well-surveyed but which are thought to have agricultural potential. The field work has now (November 1974) been halted by the monsoon rains and will start again in 1975. The LKTT should, at this stage, review the information collected so far and relate it to the land use proposals in this Report. The Authority should also direct the surveyors to the areas proposed for early development particularly those proposed for the seven oil palm estates (OPE – 1 etc.).

A crash programme of research into crops other than oil palm and rubber has been proposed for MARDI (Chapter 8, Section 8.7.1). The Institute has already taken steps to enlarge the research programme at their FES Jerangau. The LKTT should follow the course of this programme closely and ensure that MARDI's recommendations are passed to developers and that the latter are observing the rules of correct land use and conservation.

Several pilot projects for diversified crops have been proposed (Chapter 8, Section 8.7.2). In most cases, the land areas involved are already released from logging, or the small acreage required could be released shortly. During the next few months, therefore, the LKTT should canvass investors likely to be interested in such projects and invite proposals from them. The aim should be to get at least some of the pilot projects started during 1975.

The agricultural programme is the critical path for a number of operations (Section 14.2). The need for processing facilities at a certain time has already been determined by present planting programmes. The concept of centralised processing will have to be explained to developers of oil palm estates. This should be done as soon as possible and the LKTT should indicate its commitment to the principle and its active involvement in setting up an Oil Palm Milling Corporation.

The importance of the timely provision of roads, housing and services for the agricultural sector has already been stated. It is considered crucial to the success of the land development programme.

14.5 The Management of Development

14,5.1 Introduction

Development of Trengganu Tengah involves a large number of agencies in the public and private sectors. Overall planning, control and evaluation is being done by the Lembaga Kemajuan Trengganu Tengah.

A general review of the public sector agencies most likely to be involved in Trengganu Tengah has been made in Chapter 5. In this section, the structure of the Development Authority is examined and recommendations are made for changes where these are considered necessary to enable LKTT to carry out its role successfully bearing in mind the need for immediate action indicated earlier in this chapter. Other agencies are also mentioned in view of the various roles in planning, advice or implementation.

14.5.2 The Development Authority

Throughout this Report, mention has been made of the vital part to be played by LKTT in nearly all aspects of development. While many individual functions can be undertaken by existing agencies, some of them are already fully committed on other projects. It therefore falls to the LKTT to make up any shortfalls in capability in any sector. Furthermore, the Authority has to be the overall co-ordinating and monitoring agency for the development area.

At present, the LKTT organisation consists of three divisions — Administration, Project Programming and Evaluation, and Land Development and Settlement. The rangeof activities proposed for the LKTT in future suggest that the structure should be altered to place more emphasis on implementation and technical aspects. The Consultants have observed that the Authority is already well-served by its existing staff in the field of planning and economic evaluation. It is suggested, therefore, that the Authority should be reorganised to consist of four divisions under the General Manager (Table 14.5).

Administration and Finance Division

This division will continue to handle the administration and financial affairs of the Authority as at present. The financial side should be strengthened by the addition of a qualified Accountant. The Administrative Officer should head the division and will act as Secretary to the Board of LKTT. In future, when the Authority has a place on the Boards of other companies with investments in Trengganu Tengah, the Administrative Officer could be the designated representative of the LKTT. This would require some knowledge of company law and organisation and it would be desirable for the officer concerned to undergo some training in company secretarial work or business administration.

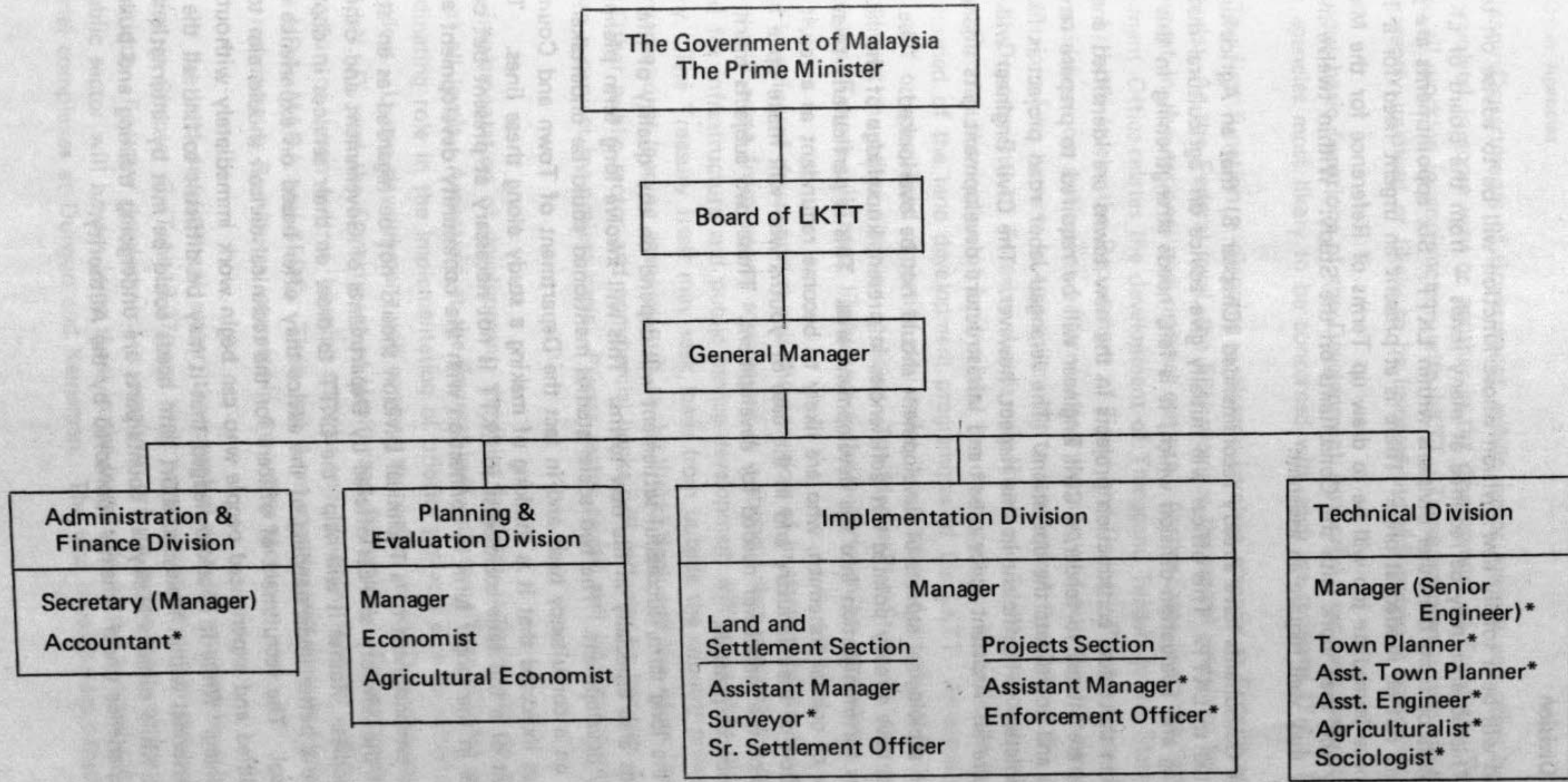
Planning and Evaluation Division

This division is already engaged in reviewing proposals for projects and in making planning projections on an overall basis for the area. In addition to the head of the division, there are an Economist and an Agricultural Economist. This level of staff is considered to be adequate for the time being and the division will be much strengthened by the addition of a Technical Division to the organisation.

Implementation Division

This division will consist of the present Land and Settlement Division plus a Projects Division. The emphasis is to be on the practical implementation of component projects in the overall plan. The staff should have a dynamic approach to the considerable problems likely to be encountered and should either be experienced in implementation on a large scale or be given the chance to study the problems presently being tackled on such developments as Pahang Tenggara and Johor Trengganu. The Land and Settlement section will continue its present functions and would be strengthened by the addition of a qualified Surveyor who would be able to handle the legal aspect of land alienation and release. The Projects section will have to be set up from scratch and should be headed by someone with a proven record in project implementation. The LKTT have indicated that they require an Enforcement Officer to ensure that the legal requirements concerning participation of Bumiputras and development targets are met. This officer would be placed in the Projects section.

Table 14.5 Proposed Organisation of Lembaga Kemajuan Trengganu Tengah



* Indicates post to be filled.

Technical Division

This will be a totally new division whose function will be to advise on technical matters. This advance may be required at many levels – from the Board of LKTT, from investors or from the other divisions within LKTT. Six appointments are proposed but they are not all needed at once. There is at present an urgent need for a Town Planner whose immediate job will be to draw up Terms of Reference for the Master Plan Study and then work with the Consultants on the Study. Within twelve months, this officer may well require an assistant.

The Consultants have already recommended (Chapter 8) that an Agriculturalist be appointed to LKTT. This officer will initially give advice on agricultural matters to the Planning and Evaluation division which, it is felt, needs strengthening in this respect.

When the actual construction projects in the new towns are identified and contractors are invited to tender, a Civil Engineer will be required to prepare tender documents and coordinate the operations. The Jerangau-Jabor road project is likely to be completely self-sufficient in this respect, however. The Civil Engineer will most likely require an Assistant once urban and infrastructure development gets under way.

The sociological aspects of development should not be overlooked. The Consultants have already pointed out deficiencies in present knowledge of the likely motivations for immigration into the development area. This is particularly relevant in the case of coastal fishermen, who are likely to become redundant as a result of modernisation of their industry and in the case of youths who will make up a large proportion of the manpower needed for development. These two subjects merit special study as soon as possible.

In the long term, successful settlement will depend on the quality of life in the development area especially in the new towns. This will involve long term planning of community development. The two social studies mentioned could be undertaken by a sociologist on a consultancy basis and in fact the Department of Town and Country Planning has indicated that it is thinking of making a study along these lines. The appointment of a full time sociologist to LKTT is not necessary at present but could be desirable in the longer term in connection with the community development aspects.

The establishment of a Technical Division should not be regarded as an attempt to supplant the advisory services offered by Departments of Government and other technical bodies. Rather it will help the LKTT to draw on their services in depth and to have a better understanding of the advice they offer based on experience at a national level. The recruitment of officers for the technical divison should aim to secure qualified and experienced people who can begin work immediately without further training. While it is acknowledged that it may be difficult to find all the required personnel within Malaysia, short term needs could be met by international recruitment while suitable Malaysian counterparts are undergoing training and building up their experience under schemes sponsored by the Authority.

14.5.3 Other Agencies

Many Departments of Government, public sector agencies and other bodies are already involved in some way or another in the development of Trengganu Tengah. They are all working in conjunction with LKTT. Those mentioned here are the ones either presently involved or likely to be involved but this review is not exhaustive.

Four basic functions of the Development Authority have been distinguished and the agencies most likely to be concerned with each are reviewed (Table 14.6).

The first function – planning – already involves agencies at Federal and State levels. At the Federal level, the EPU provides the general guidelines for development in the national and regional context. At the State level, the State Development Office relates the development of Trengganu Tengah to the State as a whole. At both levels, the Department of Town and Country Planning provides general guidelines on settlement pattern, urban planning and building standards and, if possible, provides experts in town planning to supplement the staff of the LKTT. The State Departments of Forestry, Lands and Mines and Survey are concerned with the timing and authorisation of land release for development. They should be kept fully informed of the land development programmes of the LKTT. In certain areas, lack of staff or specialised expertise may make it necessary to employ consultants to supplement the other planning agencies. The Master Plan Study for the new towns in Trengganu Tengah will most likely have to be undertaken by consultants.

Financing of development and the provision of investment funds, the second function, will come from several sources but it is thought that most of the capital required for infrastructure and public service development will come from the Federal Treasury. The Treasury itself may seek loans from outside the country principally from international lending agencies such as the World Bank and the Asian Development Bank. Other public sector and commercial banks will certainly be involved but most likely on a project by project basis. Private sector capital will play an important part too.

Implementation of development, the third function, is dealt with by many bodies at all levels. Assistance at the Federal level will come from ICDAU who play a coordinating role in the implementation of priority projects such as infrastructure and services. Urban development will concern the public service Departments such as JKR, LLN, JT, and the Department of Health and Education. Financing and construction of urban centres, housing schemes and industrial facilities will most likely involve UDA, MARA and SEDC. These last three agencies will play an important part in representing Bumiputra interests in the urban sector.

In the land development sector, the principal agencies involved have been identified in Chapter 8 (Table 8.37) and their programmes set out in terms of 5 Year Plan periods. Forestry development is largely in private sector hands at present but the public sector will have a large share in the ownership of the two wood-based industrial complexes at Dungun and Kemaman. The land development programme for

Table 14.6 The Functions of Agencies Involved in Trengganu Tengah

DEVELOPMENT AUTHORITY

LKTT

PLANNING

Federal Level	–	EPU Department of Town and Country Planning
State Level	–	Development Office
	–	Forest Department
	–	Department of Lands and Mines
	–	Department of Survey
Special Studies	–	Consultants

FINANCE AND INVESTMENT

- International lending agencies
- Federal Treasury
- Development Bank of Malaysia
- Bank Pertanian
- Commercial Banks
- MIDF
- Private Sector

IMPLEMENTATION

Federal Level	–	ICDAU
Urban Development and Services	–	UDA, MARA, SEDC, JKR, LLN, JT
	–	Dept. of Education
	–	Dept. of Health
Industrial Projects	–	FIDA, SEDC, MRDC
	–	Private Sector
Agricultural/ Forestry Projects	–	FELDA, FELCRA, RISDA, SEDC
	–	MAJUTERNAK, FIMA, FAMA, etc.
	–	Private Sector
Rural Extension Services	–	Department of Agriculture
	–	FOA, RISDA, FAMA
	–	Bank Pertanian

TECHNICAL ADVICE

- MARDI, RRI
- Ministry of Agriculture and Fisheries
- Dept. of Forestry
- Dept, of Town and Country Planning
- JKR, DID, FIDA
- Consultants

For explanation of initials refer to Glossary at the beginning of Vol. I

Trengganu Tengah consists of a number of large projects, either estates or settlement schemes. It has not been possible to analyse in depth the position of the existing smallholder farmers in the area. However, agencies exist to assist them and represent their interests. Extension of technical advice, finance; materials and marketing facilities are handled by the State Department of Agriculture, FOA, RISDA, FAMA and the Bank Pertanian. Concerted effort by these agencies should ensure that the independent smallholders of Trengganu Tengah are not left behind in the general increase in prosperity forecast for the region.

The last function in the development process is technical advice. The proposal to set up a Technical Division in the LKTT has been made in the previous section and this should enable the Authority to be receptive to technical assistance on a wide range of subjects. Town planning and infrastructure will involve the advisory branches of the Department of Town and Country Planning, JKR and DID (in the case of water resources, drainage and flood control). Advice on industrial development should be sought from FIDA. The large agricultural programme will certainly require technical assistance from MARDI, RRI and the various branches of the Ministry of Agriculture and Fisheries. The expertise of the Forestry Department Headquarters is already playing a vital role in the planning of forest development. Where the resources of existing agencies are over-extended consulting services may have to be called for.

Most of the agencies mentioned are already involved in Trengganu Tengah. They represent a wide range of functions, services and disciplines and with coordination by the LKTT their efforts should ensure the successful development of Trengganu Tengah.

CHAPTER 15

Economic and Financial Analysis

15. ECONOMIC AND FINANCIAL ANALYSIS

15.1 Introduction

In this chapter the economic implications of the various development proposals are analysed. The necessary investment programme is set out with particular attention to the role of public sector financing. This is followed by an economic evaluation of the whole development plan.

The economic analysis of agriculture is concerned primarily with oil palm production and rubber production as these two tree crops are likely to dominate agriculture in Trengganu Tengah in the years up to 1990. Returns to factors from oil palm production have been calculated from a group of estates supplying one mill, rather than from total additional oil palm acreage as this latter measurement would produce somewhat distorted returns due to the long period of development. Returns to factors in rubber production have been estimated for the total planned additional rubber acreage in Trengganu Tengah as there are only two major developments proposed. The period of evaluation has been extended to the year 2,000 to allow for inclusion of benefits in later years. An estimate is included of the tax revenues obtainable from both crops. Returns to rubber and oil palm are also tested for sensitivity to higher fertiliser costs and lower product prices. Economic analysis of other agricultural crops is restricted by the lack of available data relevant to likely conditions in Trengganu Tengah although estimated returns from cocoa and coconuts are included.

The economic analysis of logging and sawmilling relates principally to the proposed complex to be sited at Durian Mas. An estimate of the total proceeds from all logging and sawmilling within the region is also included in order that an assessment can be made of the potential for raising public sector revenue from this source.

The investment programme requires substantial expenditure amounting to over $400 million on capital items alone by 1990. It is not considered that the financing of this amount will prove difficult provided the financial climate does not deteriorate significantly. Given that the returns to oil palm and forestry investment are sufficiently attractive to encourage private investors and that the capital cost of the main highway can be financed by an international lending agency, the other requirements are unlikely to pose an undue burden on the existing system.

The economic analysis indicates that productivity from the modern agricultural and forestry sectors will be high, thus meeting one of the principal NEP objectives. The adoption of a daily wage rate of $6 should go some way to meeting the income distribution aims of the national economic policies as should the proposals for higher standards of housing and community services.

Given that basic housing and community services have to be provided wherever people live, the return to the additional investment required to develop Trengganu Tengah is considered acceptable at 12 percent over 20 years.

15.2 Agricultural Economics

15.2.1 Economic Analysis of Oil Palm Development

Cash Flows

The economic analysis of the oil palm developments is presented in two principal tables (15.4 and 15.5), which show respectively the cash flow of a single group of estates totalling 22,500 acres serving a central 65 tons ffb/hour mill, and the total cash flow for all the oil palm estates developed in Trengganu Tengah between 1970 and 1990. The second table is not directly compatible with the production figures shown in Table 8.38, which refer to all the oil palm in Trengganu Tengah, including that planted before 1970.

The principal components of the cash flows are as follows:

(i) **Output** is calculated in accordance with the planting programme shown in Tables 8.34 and 8.35 and with the yields shown in Table 8.5.

(ii) **Gross revenues** are calculated using a price of $600 fob for oil and $400 fob for kernels (see Section 8.4), assuming 20 percent of ffb to be oil and 4 percent kernels (ffb equivalent of $136 per ton).

(iii) **Field costs** are calculated from the phased build-up of area and the costs of establishment and maintenance per acre shown in Table 15.1.

(iv) **Field labour costs** are calculated from the phased acreages and the per acre labour requirements shown in Table 8.6. Labour is costed at $6.00 per day. This is more than the current cost of labour for agricultural work, but it is the minimum considered necessary to induce large-scale migration into Trengganu Tengah in the long run, assuming a steady rise nationally in real returns to labour in conformity with the aims of the NEP. A figure of $6 per manday is equal to a family income of $2,145 per year, assuming 250 working days and 1.43 labour units per family. It is unlikely that new settlers will move into the area for less than this plus the value of a new house ($6,000 amortised at 7 percent over 20 years is equal to a further annual equivalent income of $566).

(v) **Management and administration costs** are calculated on yearly per acre basis. On estates, managements costs (Table 15.2) amount to $18.00/acre per year and on settlement schemes to $19.00/acre per year. Annual costs of administrative buildings and vehicles on both types of project amount to $69.75/acre (Table 15.3). Maintenance of vehicles and buildings is costed as a replacement cost equivalent to 30 percent of the administrative cost every eight years.

Table 15.1 Oil Palm Physical Input Costs

Year	0	1	2	3	4	5	6	7	8	9–25
	$ per acre planted									
Establishment										
Survey and land clearing (Chain Saws)		1.0								
Weed Control after land clearing		2.4								
Cover crop establishment and maintenance		28.0								
Lining, platforming, holing and planting		84.0								
Inspection and harvesting paths	0.3	0.4								
Road construction (Bulldozers and Gravelling)		24.0		120.0						
Drainage	0.3		4.6							
Sub-total Establishment	0.6	139.8	4.6	120.0						
Maintenance										
Fertilizer		46.5	60.5	80.0	95.6	95.6	95.6	95.6	95.6	95.6
Pesticides and herbicides		23.1	21.3	21.2	18.5	13.2	13.2	13.2	13.2	13.2
Harvesting transport					0.8	6.1	15.3	20.0	23.8	25.0
Road and drain maintenance				0.6	20.1	20.1	20.1	20.1	20.1	20.1
Harvesting paths maintenance					1.3	1.3	1.0	1.0	0.3	0.3
Knapsack sprayer @ $80 plus, $8 spares and repairs for four year life	0.8	0.6	0.4	0.3	0.3	0.5	0.5	0.5	0.5	0.5
Pollen puffers, pollen blowers @ $80 for five year life			0.1	0.1	0.1	0.3	0.3	0.2		
Harvesting tools					0.1	0.9	1.5	1.9	2.2	2.3
Sub-total maintenance	0.8	70.2	82.3	102.2	136.8	138.0	147.5	152.5	155.7	157.0
GRAND TOTAL	1.4	210.0	86.9	222.2	136.8	138.0	147.5	152.5	155.7	157.0

Source: Trengganu Tengah Regional Planning Study. Discussion Paper, Evaluation of Alternative Development Strategies,(4) July 1974 (amended).

(vi) **Housing costs** are calculated for each estate according to the number and phasing of workers and supervisory staff. Housing costs are as follows:

Managers	$60,000
Asst. Managers	$37,500
Supervisors	$20,000
Field Assistants	$10,000
SDA's and clerks	$ 7,500
Workers	$ 6,000

(vii) **Mill capital costs** are taken directly from Chapter 10, Table 10.7, where they are set out in detail and phased over the study period.

(viii) **Mill operating costs** are calculated on the basis of ffb throughput. The separate components are as follows:

Materials	:	$3.68 per ton ffb
Labour	:	$1.10 per ton ffb
Salaries	:	$1.20 per ton ffb

(ix) **Transport and distribution costs** are calculated on the basis of $20.00 per ton for oil and $15 per ton for kernels.

(x) **Export duties and surcharges** are taken to be $72.40 per ton for palm oil and $47.00 per ton for kernels. The ffb equivalent duty is therefore $16.36 per ton.

Table 15.2 Basis for Costing Management in Oil Palm Schemes

Personnel	Numbers (1)	Cost per person	Total cost
FELDA 5,000 acre scheme			
		$	
Manager	1	12,000	12,000
Assistant Manager	1	7,500	7,500
Supervisors	3	5,100	15,300
Field Assistants	10	3,240	32,400
Settler Development Assistants	2	3,240	6,480
Clerks and Typists	4	5,820	23,280
Total			96,960 = $19 per acre
Estate of 5,000 acres			
Manager	1	30,000	30,000
Assistant Manager	1	15,000	15,000
Conductors	5	6,000	30,000
Senior Clerk	1	6,000	6,000
Clerk/Typist	2	4,000	8,000
Total			89,000 = $18 per acre

(1) for phasing see Table 8.8.

Table 15.3 Cost Basis for Administrative Buildings and Vehicles on Oil Palm Estates

	$ per 5,000 acres
Administrative buildings	
Store and office buildings	70,000
Other equipment	10,000
	80,000
Vehicles	
2 private vehicles @ $15,000	30,000
4 5 ton lorries @ $30,000	120,000
2 65 HP tractors @ $20,000	40,000
2 3 ton tipping trailers @ $4,500	9,000
1 diesel generator	6,250
Radio equipment	7,000
Digger	50,000
Pollen storage equipment	6,500
	268,750
TOTAL	348,750
Administrative costs per acre	$ 69.75

Table 15.4 Cash Flow for Group VI Oil Palm Estates with One Centralised Mill

Year	Gross Output	Gross Revenue	Housing (Capital and Maintenance)	Field Costs excluding Labour	Field Labour Costs	Field Management Costs	Field Adminis-trative Costs	Mill Capital Cost	Mill Operation: Labour and Management	Mill Operation: Materials	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	65	–	–	–	–	– 384	– 120
1	–	–	600	200	272	55	148	–	–	–	–	– 1,275	– 675
2	–	–	1,184	534	662	129	288	–	–	–	–	– 2,797	– 1,613
3	–	–	1,780	1,268	1,331	240	427	200	–	–	–	– 5,246	– 3,466
4	281	38	1,527	2,522	2,066	332	357	6,606	1	1	1	– 13,375	– 11,848
5	2,889	393	983	2,951	2,397	388	218	–	7	11	13	– 6,575	– 5,592
6	11,966	1,627	518	3,500	2,522	405	65	–	28	44	55	– 5,510	– 4,992
7	31,804	4,324	130	3,490	2,535	405	20	–	73	117	146	– 2,591	– 2,461
8	66,286	9,015	130	3,449	2,658	405	44	1,872	152	244	305	– 244	– 114
9	110,368	15,010	130	3,384	2,751	405	86	4,248	254	406	508	2,838	2,968
10	152,236	20,704	130	3,494	2,729	405	128	–	350	560	700	12,203	12,333
11	182,631	24,838	130	3,482	2,620	405	107	–	420	672	840	16,162	16,292
12	197,483	26,858	130	3,514	2,499	405	65	–	454	727	908	18,156	18,286
13	202,321	27,516	130	3,555	2,423	405	20	–	465	745	931	18,842	18,972
14	202,790	27,579	130	3,562	2,385	405	–	–	466	746	933	18,952	19,082
15	202,509	27,541	130	3,546	2,376	405	20	–	465	745	932	18,922	19,052
16	201,571	27,414	130	3,541	2,376	405	44	–	464	742	927	18,785	18,915
17	199,446	27,125	130	3,541	2,376	405	86	–	459	734	917	18,497	18,627
18	195,321	26,564	130	3,541	2,376	405	128	–	449	719	898	17,918	18,048
19	189,196	25,731	130	3,541	2,376	405	107	–	435	696	870	17,171	17,301
20	184,071	25,034	130	3,541	2,376	405	65	–	423	677	847	16,570	16,700
21	180,008	24,481	130	3,541	2,376	405	20	–	414	662	828	16,105	16,235
22	176,000	23,936	130	3,541	2,376	405	–	–	405	648	810	15,621	15,751
23	172,000	23,392	130	3,541	2,376	405	20	–	396	633	791	15,100	15,230
24	168,000	22,848	130	3,541	2,376	405	44	–	386	618	773	14,575	14,705
25	164,000	22,304	130	3,541	2,376	405	86	–	377	604	754	14,031	14,161
									Internal rate of return (percent)			18.0	21.5

Table 15.5 Overall Cash Flow for Oil Palm throughout The Development Period, 1970 – 1990

Year	Output	Gross Revenue	Housing (Capital and Maintenance)	Field Costs excluding Labour	Field Labour Costs	Field Management Costs	Field Administration Costs	Mill Capital Costs[1]	Mill Operating Costs (Labour Management and Materials) and Transport Costs	Net Revenue before Duties and Interest Charges	Export Duties Payable at Current Rates
	tons ffb	$'000									
1970	–	–	62	8	128	62	18	–	–	– 278	–
1971	–	–	1,408	699	753	103	129	–	–	– 3,092	–
1972	–	–	125	781	851	170	25	–	–	– 1,952	–
1973	–	–	3,211	2,449	1,469	281	426	–	–	– 7,836	–
1974	981	133	4,574	2,575	2,596	543	717	–	10	– 10,882	16
1975	8,520	1,159	5,796	5,912	5,020	862	1,017	8,036	90	– 25,624	139
1976	24,050	3,543	8,885	7,544	7,045	1,235	1,564	6,606	254	– 29,590	393
1977	49,210	6,693	8,504	11,157	9,611	1,681	1,626	200	521	– 24,991	805
1978	87,517	11,902	5,585	14,961	12,123	1,921	957	8,878	926	– 33,449	1,431
1979	151,865	20,664	2,197	16,183	12,405	2,013	353	13,412	1,607	– 27,506	2,485
1980	258,812	35,198	1,153	17,857	12,958	2,030	213	11,190	2,738	– 12,941	4,234
1981	402,325	54,716	765	17,361	12,950	2,030	201	3,744	4,257	13,408	6,582
1982	579,031	78,748	2,790	17,634	13,556	2,087	542	11,904	6,126	24,109	9,473
1983	753,140	102,427	3,346	18,383	14,082	2,174	695	8,496	7,968	47,283	12,321
1984	964,882	120,237	2,881	19,387	14,299	2,231	711	–	10,208	70,520	15,785
1985	965,541	131,314	2,922	20,165	13,909	2,288	514	200	10,215	81,101	15,796
1986	991,912	134,900	938	20,946	13,989	2,370	98	6,300	10,494	79,765	16,228
1987	1,004,419	136,601	938	21,537	14,356	2,370	26	306	10,627	86,441	16,432
1988	1,002,109	139,007	938	20,861	13,994	2,370	–	–	10,602	90,242	16,395
1989	1,046,170	142,279	938	21,588	14,214	2,370	71	336	11,068	91,694	17,115
1990	1,063,573	144,646	938	21,227	14,446	2,370	71	–	11,253	94,341	17,400

[1] ffb produced in 1974 and 1975 will be milled in existing mills.

Economic and Financial Returns

From Table 15.4 the principal economic indicators relating to oil palm development in Trengganu Tengah can be derived. These are discussed briefly below, and summarised in Table 15.7. Table 15.6 is derived directly from Table 15.4 and is used to simplify the manipulation of the cash flows for economic analysis.

Table 15.6 Net Present Values of Oil Palm Cash Flow Elements Group VI, 22,500 acres

Discount rate	Full cash flow net of housing and labour costs	Housing costs	Field[1] Labour costs	Export duties at current rates
Percent		$'000		
7	59,504	6,418	24,125	17,801
10	31,566	5,695	18,011	11,816
12	19,614	5,286	15,121	9,140
15	7,860	4,785	11,910	6,342
20	−2,261	4,132	8,443	3,624

(1) These figures divided by 6 equal the discounted number of man days.

(i) Internal rates of return

The return to capital in oil palm at forecast prices is high, even allowing for a $6 per day return to labour. If the full cost of housing is allowed for the rate of return over 25 years will be 18.0 percent, and if no housing is allowed for this will rise to 21.5 percent.

(ii) Financial rate of return

The financial rate of return indicates the expected yield on capital to a potential investor, allowing for a reasonable return to labour and for duties payable to the State or Federal Government. A private investor would probably have to provide free housing to attract workers and therefore the returns used here are net of housing costs and $6 per day for labour. They are also net of export taxes at present rates. The calculated return to capital under these assumptions is approximately 16 percent. This may be higher than the Government is prepared to allow and may also be more than is necessary to attract private capital. Thus some scope may exist for an increase in duties. If a 12 percent real return to capital were permitted (net of inflation) the surplus net present value after 25 years would be $10.5 million. This could be collected in the form of additional duty equal to 2.2 times the present rate. Thus the present duties of $72.4 per ton of palm oil and $47.0 per ton of kernels could reasonably be raised by up to 100 percent and still leave an adequate return to labour and capital.

(iii) Returns to labour

The returns to labour can be measured by dividing the net present value of the cash flow excluding labour costs by the discounted number of man days employed over the period (see Table 15.6). If a 12 percent discount rate is used (allowing a 12 percent return to capital), the theoretical return to the labour employed is $13.80 per man day after allowing for the value of housing. Not allowing for housing costs this would be $15.90 per day. This theoretical return to labour is high and is a measure of the relatively high capital intensity of oil palm development. It is, of course, for this reason fairly sensitive to the return to capital. For example, where the return to capital is 15 percent, the return to labour falls to $10.0 per day, and at 20 percent return to capital, the return to labour falls to $4.40 per day.

On FELDA settlement schemes,more favourable financial terms would be available, and returns to labour would be correspondingly higher. However, actual disposable returns to labour would have to be calculated net of export duties. Using a discounted rate of 7 percent and deducting the duty element from total returns, the return per man day is $16.40 net of housing costs. On a 14 acre holding, the mean annual labour input from the family would be approximately 280 man days per year (Table 8.6). Thus the available income to settlers on 14 acre holdings, net of financial charges and duties, would be $4,592 per annum plus the value of the house. This is considerably more than current expectations of FELDA settlers, and thus (as in the case of estates) there is scope for an increased return to Government in the form of higher duties. If duties were doubled, the income available to settlers would still be $3,344 per annum plus the value of their house.

A further alternative on FELDA schemes in these circumstances would be to allow smaller holding sizes and thus settle more people on lower average incomes. For example, at present rates of export duty an annual net income of $2,500 for 25 years plus the value of a house would be available to a settler family from eight acres. However, to reduce holding sizes in order to spread incomes would have certain undesirable effects for the regional development. In the first place it would result in a serious under-utilization of labour (10 acres, for example, only requires 200 man days per year from a family) in an area where labour is likely to be a scarce factor, at least initially. Secondly, it would reduce incentives for potential migrants. Thirdly, it would reduce settler's security in the event of adverse market conditions. A better distribution of income would therefore, almost certainly be accomplished through higher (and flexible) rates of tax rather than through reduced holding sizes.

(iv) **Return to land**

For comparison with rubber, the return to land from oil palm has been measured by dividing the net present+ value of the oil palm development by the area developed, allowing 12 percent return to capital and a return to labour of $6 a day plus housing. The area itself must be adjusted to allow for the time element. Thus the respective acreages developed over the seven-year planting period are discounted to Year 0. The total acreage of 22,500 acres is thus reduced to 15,988 acres at 12 percent discount and 16,850 acres at 10 percent discount. On this basis, the net present value of the return to land over 25 years is $1,227 per acre, or an annual equivalent return of $156 per acre. Allowing a return to capital of 10 percent would raise this to $1,873 per acre over 25 years or an annual equivalent return of $206 per acre.

Table 15.7 Calculated Returns to Factors of Production on Oil Palm Schemes

	Percent
Return to capital net of housing costs and labour @ $6 per day	18.0
Return to capital net of labour but not housing	21.5
Return to capital net of labour, housing and duties	16.0
	$ per day
Return to labour before duties allowing 12 percent return to capital and allowing the value of a house	13.80
Return to labour after duties allowing 7 percent return to capital and allowing the value of a house	16.40
	$ per acre per year
Return to land, net of housing, labour at $6 and capital at 12 percent	156
Return to land, net of housing, labour at $6 and capital at 10 percent	206

Tax Revenues from Oil Palm

The great majority of personal incomes in the oil palm development will be below a level appropriate for direct taxation. This applies to all agricultural labourers on estates and to FELDA settlers, whose incomes will be paid net of all dues for loan repayment and export duties. The principal source of income to the Government will, therefore, be export duties on palm oil and kernels.

It has already been shown that the present rates of duty allow a higher return to capital than may be necessary to attract private investors and they would also leave substantially higher returns to settlers than current targets. The Consultants believe that scope exists for levying up to twice the current rates from oil palm, assuming the yield and price forecasts used in this study. Table 15.5 shows the flow of revenue from duties at current rates. This rises to a peak of $17.4 million by 1990, and totals $153 million over the period up to 1990. To increase this figure through higher duties would not necessarily be worthwhile as an end in itself, but scope nevertheless exists for increasing Government revenues from oil palm to some $300 million, if a higher level of self financing is considered desirable for the region's infrastructure and if a more equitable income distribution is considered appropriate, either regionally or nationally.

Sensitivity Analysis

In current conditions the prices of certain commodities are likely to change significantly. In view of these probable price movements the returns from oil palm production have been tested for sensitivity to a 50 percent increase in the cost of fertilizer and a 20 percent fall in the gross value of output.

If the cost of fertilizer rises by 50 percent the net present value of the full cash flow to oil palm growing falls by 19 percent when discounted at 10 percent and by 25 percent when discounted at 12 percent assuming no change in the price of other inputs and allowing for labour costs of $6 per day. The internal rate of return before charging duties and interest but after deducting housing costs falls from 18 percent to 17 percent. The returns from oil palm growing are not therefore unduly sensitive to changes in the price of fertilizer.

A fall in the price of palm oil and palm kernels of 20 percent results in the internal rate of return falling from 18 percent to 14 percent. At a discount rate of 10 percent the net present value of the full cash flow falls by 61 percent. Thus the returns to oil palm reflect closely changes in product prices. The fact that returns to oil palm are tolerant to changes in end prices and certain variable costs is due to the fact that once oil palm plantations are well established, purchased inputs do not constitute a high proportion of annual revenue. Between Years 10 and 25, field costs, mill material costs and transport costs average only 20 percent of the annual gross revenue.

15.2.2 Economic Analysis of Rubber Development

Cash Flows

The approach to the analysis of the rubber developments is the same as that used in sub-section 15.2.1 for oil palm. However, the area to be planted to rubber is very much smaller than that planned for oil palm, and consequently only one cash flow is presented (Table 15.11) showing the whole rubber development in Trengganu Tengah.

The main components of the cash flow are as follows:

(i) **Output** is calculated in accordance with the planting programme shown in Tables 8.34 and 8.35 and with the yields shown in Table 8.10.

(ii) **Gross revenues** are calculated using a price of 60 cents per lb. fob (see Section 8.4).

(iii) **Field costs** are calcualted from the phased build-up of area and the establishment and maintenance shown in Table 15.8.

(iv) **Labour** is costed at $6 per day as for oil palm.

(v) **Field capital costs** have been calculated (Table 15.9) in accordance with the phased build-up of planting. Maintenance of administrative buildings and labourers housing is calculated on the same basis as for oil palm.

(vi) **Management costs** have been worked out in accordance with the phased requirements of the individual estates, as shown in Table 15.10.

(vii) **Factory costs** are calculated as follows:
Capital investment phased as in Chapter 10. Processing materials @ 3 cents per lb., falling to 2.7 cents per lb. in the third year. Processing labour and salaries @ 2.7 cents per lb. falling to 1.2 cents per lb. in the third year. Transport and distribution @ $40 per ton.

(viii) **Export duties** are taken to be 10.125 cents per lb.

Table 15.8 Rubber Physical Input Costs

Year	0	1	2	3	4	5	6	7	8	9	10	11	12–15	16–25
							$ per acre planted							
Establishment														
Survey and land clearing (Chain Saws)		1.0												
Weed control after land clearing		2.4												
Cover crop establishment and maintenance		28.0												
Lining, holing, terracing, planting		24.3												
Road Construction		38.2					57.6							
Drainage			5.0											
Maintenance														
Herbicide		8.6	12.0	10.9	9.8	6.0	3.3	4.4	3.3	3.3	3.3	3.3	3.3	3.3
Fertilizer		14.9	23.5	25.2	33.8	37.7	37.7	48.8	48.8	48.8	48.8	48.8	57.6	66.3
Pruning		–	–	–	–	–	–	–	–	–	–	–	–	–
Road Maintenance			4.0	4.0	4.0	4.0	4.0	9.6	9.6	9.6	9.6	9.6	9.6	9.6
Drainage			0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Ethryl and palm oil (1)														25.2
Coagulating and storage								3.1	5.1	6.3	7.1	7.5	8.0	10.0
Transporting coagulum								0.6	1.0	1.2	1.3	1.4	1.5	1.9
SUB-TOTAL PHYSICAL INPUT COST	–	121.4	45.1	40.7	48.2	48.3	103.3	67.1	68.4	69.8	70.7	71.2	80.6	116.9
Field equipment	0.8	0.6	0.4	0.4	0.4	0.3	0.3	18.3	4.8	4.8	4.8	4.8	13.1	8.1
TOTAL	0.8	122.0	45.5	41.1	48.6	48.6	103.5	85.4	73.2	74.6	75.5	76.0	93.7	125.0

(1) Stimulation from Year 16.

Table 15.9 Trengganu Tengah: Estimated Field Capital Costs, Rubber Development 1970 – 1990

Bukit Besi Estate			$
Administrative buildings			137,200
Vehicles			298,600
Staff housing			
Manager	1 @	$60,000	60,000
Asst. Manager	8 @	37,500	300,000
Supervisors	30 @	20,000	600,000
Clerks	10 @	7,500	75,000
Workers[1]	1956 @	6,000	11,736,000
	TOTAL		13,206,800

Three Private Estates			
Administrative buildings			98,000
Vehicles			213,600
Staff housing			
Managers	3 @	$60,000	180,000
Asst. Manager	2 @	37,500	75,000
Supervisors	20 @	20,000	400,000
Clerks	10 @	7,500	75,000
Workers[1]	825 @	6,000	4,950,000
	TOTAL		5,991,600

[1] Participation rate of 1.43 workers per family.

Table 15.10 Additional Management Requirements Rubber Development, 1970 – 1990

Bukit Besi Estate		New Estates	
1971 – 1975	**$ per year**		**$ per year**
1 General Manager	30,000		
1 Asst. Manager	15,000		
6 Supervisors	36,000		
4 Clerks	16,000		
12 Total	97,000		
1975 – 1980			
4 Asst. Managers	60,000		
5 Supervisors	30,000		
21 Total	187,000		
1980 – 1990		**1980 – 1985**	
3 Asst. Managers	45,000	2 Managers	45,000
19 Supervisors	114,000	2 Supervisors	12,000
6 Clerks	24,000	4 Total	57,000
49 Total	370,000		
		1985 – 1990	
		1 Manager	20,000
		2 Asst. Managers	24,000
		18 Supervisors	108,000
		10 Clerks	40,000
		35 Total	249,000

Table 15.11 Trengganu Tengah: Cash Flow for Rubber Development, Implemented in 1970 — 1990

Year	Cumulative Area Developed	Yield	Gross Revenue	Housing Costs	Field Costs	Field Labour Costs	Field Management Costs	Field Administrative Costs	Factory Capital Costs	Factory Operation: Material	Factory Operation: Wages and Salaries	Transport Costs	Net Revenue before Duties and Interest Charges: Including Housing Costs	Net Revenue before Duties and Interest Charges: Excluding Housing Costs	Export Duties
	Acres	Tons/drc	$'000												
1971	2,680	–	–	345	2	66	97	210	–	–	–	–	– 720	– 375	–
1972	6,100	–	–	7	330	876	97	–	–	–	–	–	– 1,310	– 1,303	–
1973	10,180	–	–	7	575	1,428	97	–	–	–	–	–	– 2,107	– 2,100	–
1974	14,780	–	–	101	767	1,980	97	–	–	–	–	–	– 2,945	– 2,844	–
1975	15,380	–	–	609	1,018	2,382	187	55	–	–	–	–	– 4,251	– 3,642	–
1976	15,380	–	–	98	747	1,506	187	–	–	–	–	–	– 2,538	– 2,440	–
1977	15,380	–	–	29	858	1,146	187	–	1,310	–	–	–	– 3,530	– 3,501	–
1978	15,380	742	997	859	1,030	1,204	187	63	–	50	50	30	– 2,476	– 1,617	168
1979	15,380	2,155	2,896	1,686	1,163	1,662	187	–	–	135	85	86	– 2,108	– 422	489
1980	16,380	4,179	5,616	2,916	1,305	2,430	427	411	420	253	112	167	– 2,825	+ 91	948
1981	19,054	6,736	9,053	2,741	1,335	3,666	427	–	–	407	181	269	+ 27	2,768	1,528
1982	22,576	8,498	11,421	1,648	1,529	4,920	427	16	–	514	228	340	1,799	3,447	1,927
1983	24,643	9,649	12,968	826	1,803	5,682	427	–	840	584	259	386	2,161	2,987	2,188
1984	25,434	10,342	13,900	603	1,853	5,694	427	–	–	626	278	414	4,005	4,608	2,346
1985		10,750	14,448	847	1,863	5,676	619	71	–	650	289	430	4,003	4,850	2,431
1986		10,959	14,729	435	1,956	5,208	619	63	1,310	663	295	438	3,742	4,177	2,486
1987		11,502	15,459	847	2,191	5,280	619	–	–	696	309	460	5,063	5,904	2,609
1988		12,721	17,097	1,621	2,437	5,701	619	123	–	769	342	509	4,976	6,597	2,885
1989		14,638	19,673	2,375	2,583	6,432	619	–	–	885	394	586	5,799	8,174	3,320
1990		16,603	22,314	2,312	2,695	7,188	619	16	–	1,004	446	664	7,370	9,682	3,766
1991		16,857	22,656	323	2,684	7,620	619	–	–	1,020	453	674	9,263	9,586	3,823
1992		17,295	23,244	323	2,699	7,800	619	–	–	1,046	465	692	9,662	9,923	3,923
1993		17,438	23,437	323	2,750	7,914	619	21	–	1,055	469	698	9,050	9,911	3,955
1994		17,492	23,509	323	2,815	7,968	619	63	–	1,058	470	700	9,555	9,816	3,961
1995		17,377	23,354	323	2,853	7,998	619	–	–	1,051	467	695	9,410	9,671	3,961
1996		17,143	23,040	323	2,898	8,040	619	123	–	1,037	461	686	8,915	9,176	3,888
1997		18,021	24,220	323	2,981	8,148	619	–	–	1,090	484	721	9,916	10,177	4,087
1998		16,846	22,641	323	3,089	8,286	619	16	–	1,019	453	674	8,224	8,485	3,821
1999		16,487	22,159	323	3,154	8,364	619	–	–	997	443	659	7,662	7,923	3,739
2000		16,124	21,671	323	3,179	8,394	619	–	–	975	433	645	7,165	7,426	3,657
										Internal rate of return (percent)			11.0	14.9	

Economic and Financial Returns

From Table 15.11 the principal economic and financial indicators to the rubber development can be derived. As with oil palm, the net present values of the main variable elements of the cash flow have been calculated and are shown below in Table 15.12 at various discount rates.

Table 15.12 Net Present Values of Cash Flow Elements Rubber Development in Trengganu Tengah

Discount rate	Full cash flow net of housing costs	Housing costs	Field Labour[1]	Export duties at current rates
Percent		$'000		
5	26,110	12,720	63,063	25,215
7	13,168	10,142	46,654	17,763
10	2,151	7,423	30,714	10,856
12	−1,919	6,129	24,505	7,983
15	−5,324	4,701	17,822	5,178

(1) These figures divided by 6 equal the discounted numbers of man days.

(i) The Internal Rates of Return

The internal rate of return, allowing a return to labour of \$6 per day and allowing for the cost of all housing, is 11.0 percent over 30 years. At the end of that period there would still be some productive rubber in the ground. A period of 30 years has been used in analysis of rubber, whereas 25 years was used in Table 15.4 for calculating the returns to oil palm. The reason for this is the longer maturing period for rubber and also the fact that some of the acreage in the rubber analysis is not planted until the early 1980's.

If no allowance is made for housing costs in the analysis, the rate of return rises to 14.9 percent. With or without the housing cost the rate of return, allowing a price of 60 cents/lb fob, is acceptable.

(ii) Financial Rate of Return and Returns to Labour

Export duty has been allowed at a rate of 10.125 cents per pound fob, or 16.9 percent of the fob price. The maintenance of that rate of duty would act as a serious disincentive to private estate development, unless lower returns to labour than \$6 a day plus housing are assumed. If a private estate were to have to pay duty at the current rate and to pay the assumed rates for labour, the return to capital over 30 years would be no more than 5.3 percent, which is not adequate to attract private capital. On the other hand, a FELDA settlement scheme would probably just be financially viable under these conditions.

The sensitivity of rubber development to labour costs is much higher than that of oil palm. For example, assuming a 20 percent reduction in labour costs, to \$4.80 per day, the financial rate of return would rise from 5.3 percent to 9.9 percent, even allowing for present rates of duty and for housing costs in full. At a wage of \$4.80, however, the average family would earn only \$2,000 per year, in addition to the value of the house, which is not likely to act as a sufficient incentive for labour to migrate into Trengganu Tengah. Provided the return to capital is kept at no more than 5 – 6 percent (that is, the Government provides most of the finance on favourable terms), the rubber development should provide a reasonable return to labour and a return to Government equal to the duties calculated in Table 15.11.

This can be illustrated by calculating the returns to labour in the way used for oil palm. The net present value of the overall development, excluding labour costs, is divided by the discounted number of man days expended throughout the development period.

If 5 percent return to capital is allowed and duty is paid, the return per man day is

$$\$6.08 \quad \frac{(26,110 + 63,063 - 25,215)}{10,511}$$

This figure allows for the cost of housing.

If the return to capital were to rise to 7 percent the return to labour, net of duties, would fall to \$5.41. At 10 percent return to capital the return to labour would fall to \$4.30 net of duties.

One further possibility would be to lower the rate of duty in order to allow higher returns to capital and labour. For example, if the rate of duty were reduced by 75 percent, a rate of return to capital of 10 percent would be possible in conjunction with a return of $5.89 per man day plus the value of housing.

(iii) Return to Land

For comparison with the oil palm development, the returns to land from rubber have been measured, net of return to capital and labour. Where labour receives $6.00 per day plus housing, and capital has a return of 12 percent, the discounted return to land from rubber will be negative. Where the return to capital falls to 10 percent, the annual equivalent return to land will be $13 per acre. Even at 7 percent return to capital, the annual equivalent return to land is only $57 per acre.

Tax Revenue from Rubber

It has already been pointed out that the duty assumed in Table 15.11 is probably too high to permit an attractive return to both labour and capital. However, if public sector finance is heavily involved in the rubber development, the level of duty might just be viable. The tax revenue from rubber is nevertheless very small compared with that of oil palm, rising to $3.77 million by 1990. The total duty available from rubber between 1970 and 1990 in Trengganu Tengah will be $27.1 million, compared with a minimum figure of $153 million from oil palm.

Table 15.13 Trengganu Tengah: Calculated Returns to Factors of Production on Rubber Development

	Percent
Returns to capital net of housing costs and labour @ $6 per day	11.0
Returns to capital net of labour but not housing	14.9
Returns to capital net of labour, housing and duties	5.3
	$ per day
Returns to labour net of duties, allowing 5 percent return to capital	6.08
Returns to labour before duties, allowing 10 percent return to capital	4.30
	$ per acre per year
Returns to land, net of housing, labour @ $6 and capital @ 12%	negative
Returns to land, net of housing, labour @ $6 and capital @ 10%	13
Returns to land, net of housing, labour @ $6 and capital @ 7%	57

Sensitivity Analysis

Although the cost of fertilizer represents by far the largest single item of annual maintenance charges, the effect of raising the cost of fertilizer by 50 percent reduces the internal rate of return to rubber production by no more than one percentage point from 11 percent to 10 percent. This tolerance to changes in fertilizer costs is due to the low percentage of gross revenue absorbed by purchased inputs.

A fall in the price of rubber by 20 percent, however, exerts a much more severe pressure on returns to production than is the case with a similar price reduction for palm oil and kernels. If the price of rubber falls by 20 percent, given labour rates constant at $6 per day, the internal rate of return drops by 7 percentage points from 11 percent to 4 percent. From this it is fairly clear that a significant fall in the price of rubber is not compatible with a sustained wage rate of $6 per day.

15.2.3 Economic Analysis of Other Agricultural Crops

It is the Consultants' recommendation that commercial diversification into other crops is preceded by adequate field research and investigation on account of the considerable technical difficulties likely to be encountered in the region. At the present time economic analysis of diversified agriculture is severely restricted by the absence of field data relating particularly to variable costs and returns under Trengganu Tengah conditions. The estimates which follow must be subject to this caveat and amended accordingly as practical knowledge increases.

As the grass processing project which is already committed to development in Area 5 does not form part of the Consultants' recommendations no economic analysis of this project is included here although benefits from it have been incorporated in the overall development plan based on the details set out in the working paper prepared by the Development Authority. [75]

Crops other than oil palm and rubber considered by the Consultants to have potential in Trengganu Tengah include cocoa, coconuts, fruits and sago palm. Returns from these crops are based on the most appropriate information currently available.

Cocoa

Two projects totalling 1,489 acres have been recommended for cocoa (table 8.36). The returns of cocoa shown in Table 15.16 are based on the establishment and maintenance costs given in Table 15.14 and the yields shown in Table 15.15 assuming a constant price of $2,500 per ton dry cocoa. Harvesting costs are estimated at 12 cents per lb. of dry cocoa and processing and distribution costs at 10 cents per lb. Overhead costs are estimated at $50 per acre up to Year 2 and $100 per acre from Year 3 onwards.

Table 15.14 Establishment and Maintenance Costs of Cocoa Planted on Jungle Land

Years	0	1	2	3–30
	$ per planted acre			
Buildings & Vehicles	200			
Land Clearance and Planting	380			
Manuring/Weeding	125	135	135	74
Pest & Disease Control	32	32	32	35
Maintenance	119	84	81	41
TOTAL	856	251	248	150

Table 15.15 Revenue from Cocoa Production

Years 1 to 30

Year	Dry Cocoa lbs/acre	Revenue $/acre
0		
1		
2		
3		
4	400	446
5	500	558
6	650	725
7	750	837
8	850	949
9	1,000	1,116
10 – 30	1,000	1,116

Table 15.16 Trengganu Tengah: Cash Flow for Cocoa Production Years 0 – 30

Year	Gross Revenue	Establishment Costs	Maintenance Costs and Overheads	Harvesting and Processing Costs	Net Revenue A	Net Revenue B
			$ per acre			
0		856	50		−906	−906
1		251	50		−301	−301
2		248	50		−298	−298
3			250		−250	−250
4	446		250	88	108	19
5	558		250	110	198	86
6	725		250	143	332	187
7	837		250	165	422	255
8	949		250	187	512	322
9	1,116		250	220	646	423
10 – 30	1,116		250	220	646	423
NPV at 10%					1,903	571
IIR					18%	13%

The returns to land and capital from cocoa are attractive excluding the capital cost of housing. Allowing $600 per acre for housing in Year 0 reduces the net present value per acre to $1,303 at 10 percent discount and $551 per acre at 12 percent discount. The internal rate of return excluding housing is approximately 18 percent.

At a price of $2,500 per ton, cocoa is an attractive alternative crop in Trengganu Tengah provided the disease problems can be overcome so that yields can reach or exceed 1,000 lb. per acre. If gross revenue declines by 20 percent as a result of a comparable fall in price, then the net present value of revenue falls to $571 per acre when discounted at 10 percent (net revenue B in Table 15.16) and the internal rate of return drops to 13 percent from 18 percent. A 20 percent fall in yields would not produce such a large fall in revenue as that in price because harvesting and processing costs would also fall.

Coconuts

A total area of 5,395 acres of coconuts is included in the development plan (Table 8.36) subject to the outcome of the two pilot projects recommended in Section 8.7.2.

In order to give an indication of the return possible from pure stand coconuts, an estimate is included here based on constant 1974 prices and on hybrid yield estimates which may prove to be somewhat optimistic for Trengganu Tengah.

The cash flow set out in Table 15.19 is based on the costs and revenue estimated as follows:

Revenue

The output of dry copra per acre is based on the yield build-up in Table 8.41 which relates to high yielding hybrid material. A constant price of $800 per ton of dry copra has been assumed (Section 8.5.3). The estimated gross revenue is shown in Table 15.17.

Table 15.17 Revenue from Copra Production

Year	Yield Tons Copra/Acre	Gross Revenue $ Per Planted Acre
0	–	–
1	–	–
2	–	–
3	–	–
4	0.119	95
5	0.714	571
6	1.369	1,095
7	1.607	1,286
8	1.607	1,286
9	1.607	1,286
10 – 30	1.607	1,286

Establishment and Maintenance Costs

The costs of establishing and maintaining hybrid coconuts set out in Table 15.18 are based on estimates contained in the Johor Study (Appendix B Table 2).[6] All costs have been converted to a planted acreage basis. Processing costs are taken at $38 per ton of copra and transport costs at $10 per ton. Expenditure on processing buildings of $20 per acre is incurred in Year 3. Housing and building costs are $45 per acre for management and administration in Year 0. In Year 1, housing for workers costs $300 per acre on the basis of 20 acres per worker and houses costing $6,000 per unit. Other costs have been raised by 30 percent above the estimates used in the Johor Study.

Table 15.18 Establishment and Maintenance Costs of Coconuts

Year	0	1	2	3	4	5	6	7	8	9	10–30
						$ per planted acre					
Clearing & Planting	530	6	6	6	6	6	20	6	6	6	6
Maintenance & Equipt.	10	8	8	8	8	30	11	11	11	11	11
Fertilizer & Chemicals	78	78	87	101	106	106	106	106	106	106	106
Labour Costs	26	87	87	87	149	149	198	198	198	198	198
Processing & Transport	–	–	–	20	6	34	66	77	77	77	77
Sub-total	644	179	188	222	275	325	401	398	398	398	398
Housing	45	300	7	7	7	7	7	7	7	7	7
TOTAL	689	479	195	229	282	332	408	405	405	405	405

Returns to Factors of Production

The return to capital is attractive if the yields and margins postulated can be attained under field conditions in Trengganu Tengah. Even if gross revenue falls by 20 percent as a result of lower prices ($640 per ton of copra) the internal rate of return is still acceptable at 18 percent. The return to labour is very high with an annual gross output per man of over $20,000 at maturity. Value added per man year at full production would still exceed $15,000. Allowing a 10 percent return to capital the present value of the return to labour over 30 years is $99,432. The return to land is high with a N.P.V. of $3,419 per acre after deducting returns to capital and labour. The rewards from high yielding coconuts are considerable but the probability of achieving these returns in Trengganu must await the outcome of the recommended pilot projects.

Table 15.19 Trengganu Tengah: Cash Flow for Hybrid Coconuts

Year	Gross Revenue	Establishment and Maintenance Costs	Housing Costs	Net Revenue A	Net Revenue B
		$ per acre			
0	–	644	45	–689	–689
1	–	179	300	–479	–479
2	–	188	7	–195	–195
3	–	222	7	–229	–229
4	95	275	7	–187	–206
5	571	325	7	239	125
6	1,095	401	7	687	468
7	1,286	398	7	881	624
8	1,286	398	7	881	624
9	1,286	398	7	881	624
10 – 30	1,286	398	7	881	624
N.P.V. at 10%				3,419	1,908
I.R.R.				23	18

Vegetable and Fruit Production

Approximately 3 percent of the proposed planted acreage in Trengganu Tengah is allocated to the growing of vegetables, local fruits and citrus. The individual areas are all relatively small, however, and in the absence of field data recommendations cannot be made for extending production to cater for non-local markets.

There is considerable variation in the estimated returns from various fruit and vegetable crops. Annual gross revenue from bananas was estimated at $969 per acre by FAMA in 1971.[136] Annual net revenue per acre was estimated at $525.

Net revenue per acre from french beans amounted to $144 per crop. Given five crops per year, this implies total net revenue of $720 per acre.[136] More recent estimates from MARDI however indicate less favourable returns from this crop with negative net revenue per acre after deducting labour costs.[79]

Returns from citrus vary markedly from place to place and according to variety. A gross revenue of $880 per acre per year at maturity has been estimated by FAMA [136] for unspecified citrus although MARDI estimates tend to be significantly lower than this.[79] The conditions of high rainfall and acid soils in Trengganu Tengah are unlikely to produce high returns from citrus in the region.

In the absence of more reliable information regarding costs and returns to the many fruit and vegetable crops which might be grown in the region it is recommended that decisions regarding choice of crop be deferred until the results of the recommended feasibility study on fruit and vegetable production are known (Appendix F).

Sago Palm

Although only 400 acres is allocated to this crop in the agricultural development plan of Trengganu Tengah, it is considered that a substantially greater area may be suitable for growing sago palm (Section 8.5.5).

The world market for starch has been buoyant in recent years. Attention has, however, been directed to tapioca rather than sago as a source of supply due mainly to the unfavourable period of time between planting sago and harvesting the starch some 10 to 12 years later.

The combination of a world shortage of animal foodstuffs and resultant high prices for tapioca and sago and an earlier harvesting period of eight years tend to make sago relatively more attractive now as a source of starch on land unsuitable for other crops.

The internal rate of return to sago production over 30 years was estimated at 11.4 percent at the time of the Pahang Tenggara Feasibility Study on the sago experimental project. [1] Although costs will have risen substantially during the past three years prices of sago have also risen and the crop appears an attractive diversification possibility. As much information as possible should be gathered from the experimental project in Pahang and applied to the development of suitable areas in Trengganu Tengah.

15.3 Forestry Economics

15.3.1 Introduction

This section assesses the value of primary output from the forest resources in Trengganu Tengah. An estimate is made of the capital investment required in logging equipment and in processing facilities in the new complex. From this is derived a cashflow showing revenue from primary timber conversion. There is also an estimate of the revenue from total timber production in the region.

15.3.2 Production and Pricing

A detailed estimate of the output of timber from the agricultural development areas and from the forest reserve areas has already been given in Chapter 9 (Table 9.4). The estimated physical output is repeated in Table 15.22.

It is apparent from Table 9.4 that up to 1977, the total annual output of logs will be high from the areas to be clear felled for agriculture. The rise in production from the two major forest complex areas in Dungun and Kemaman Districts will not match the decline in output from the agricultural development areas after 1977 so that total annual log output in Trengganu Tengah is likely to fall from 1977 until 1986 when a stable level of output is reached.

There is some danger that marketing of the substantial log output from the agricultural areas will prove difficult in the depressed conditions now prevailing. If the market for logs does not improve fairly quickly the rate of log extraction will fall rapidly resulting in a delay to the rate of agricultural development. A decision must then be made as to whether standing timber should be destroyed allowing agricultural development to proceed as planned, whether agricultural development should be delayed until the rate of extraction recovers in response to market pressures or whether resources are diverted to the purchase of timber above the current market price. This decision is a difficult one to make as it inevitably involves a judgement on the future price of timber. Given the returns to the most profitable agricultural crop (oil palm) and the expected margin on log sales in any future period it is possible to assess the cost of delaying agricultural development and also indicate the price to which timber must rise in the future to justify postponing agricultural development.

Given that the return to an acre of oil palm has a present value of $1,277 when discounted at 12 percent over 25 years, a delay in implementation of one year will reduce the present value by $132 per acre. Similarly a delay of two years will reduce the present value per acre by $249 when discounted at 12 percent as shown in Table 15.20.

On the basis of a log output of 11 tons per acre, an estimate can be made of the minimum margin per ton of logs necessary to justify a delay in land clearance and agricultural development.

It is apparent from this calculation that the margin on logs would have to reach $12.0 per ton within one year to justify delay in oil palm development by this period. Similarly if a two years delay seems probable then the margin on logs would have to reach $22.6 per ton. If the variable costs of all harvesting operations amount to approximately $56 per ton then this would imply a price in one year of $68 per ton and in two years of $78.6 per ton.

The decision to delay agricultural development will obviously depend upon factors other than the simple example given. If certain areas of development are important in terms of phasing a whole project then the cost of delaying development will be much higher. In general it is the Consultants' opinion that agricultural development should only be delayed if there is a significant economic advantage based on a high probability that log prices will rise in the near future.

Table 15.20 Margin on Logs Required to Justify a Delay in Agricultural Development

Delay in years	Present value of oil palm cash flow foregone ($ Per Acre)	Equivalent margin on log sales ($ per ton)
1	132	12.0
2	249	22.6
3	354	32.2
4	447	40.6
5	531	48.3

The prices used elsewhere in this analysis relate to logs sold out of the region before conversion and sawnwood produced from the new sawmill complex. The price of logs is taken as $90 per FD ton. This is based on the unweighted average fob log price for major species in 1971 of $163 per 100 cubic metre ($89.8 per 55 cu. ft.) and estimated local of log prices during the first six months of 1974.[110]

The price of sawnwood produced in the sawmill complex is based on the following yearly estimates; $190 per ton in 1977, $200 in 1978 rising to $280 in 1979 as kiln drying is introduced, $290 in 1980 and $300 from 1981 onwards. These increasing prices are intended to reflect the rising quality and are not adjusted for inflation in any way.[112]

15.3.3 The Forestry Investment Programme

The Consultants' recommendation for investment in the Dungun Forest Reserve Complex is qualified by the fact that they have not had access to information regarding the proposed Romanian Complex to serve this area. The proposals set out in this section are designed as a basis on which further processing and manufacture may develop. We consider that the recommendation for a low cost basic sawmill unit is best suited to the prevailing conditions bearing in mind that the results of a study now being carried out by the Forest Department and FAO are not yet available.

The Kemaman Complex is already under construction on the coast. As the sawmill is being located outside the region the investment in it is not included in this analysis nor are benefits taken from the conversion of these logs.

It is considered that the existing investment in logging equipment is adequate to handle all proposed logging output except the new Dungun operation. Therefore the additional investment in logging and sawmilling relates to this new complex only.

The total investment for these proposed operations is set out in Table 15.21. This includes the estimated capital costs of the sawmill unit described in Chapter 10 (Section 10.4).

Table 15.21 Initial Capital Investment in Dungun Forest Reserve Complex

	Logging Operations				Sawmilling Complex	
	Roadmaking Equipment	Logging Equipment	Other Capital Costs	Sub Total	Capital Costs	Total
			$'000			
1975	–	–	–	–	–	Nil
1976	1,707	–	960	2,667	1,600	4,267
1977	–	1,750	–	1,750	–	1,750
1978	–	–	–	–	1,000	1,000
1979	3	–	–	3		3
1980	–	–	–	–	2,600	2,600
1981	540	1,060	250	1,850	–	1,850
1982	–	–	–	–	–	–
1983–90	–	–	–	–	–	–
TOTAL	2,250	2,810	1,210	6,270	5,200	11,470

The investment shown relates to the initial cost of the relevant items. Replacement of the various components is treated separately in the following Section 15.3.5. It is assumed that investment in road making equipment is made in 1976 so that initial work can be undertaken before harvesting in 1977. Similarly, initial clearing and construction of the sawmill complex is phased to begin before final completion of the main Jabor-Jerangau road so that limited operations can begin during 1977.

A significant investment has been allowed for road construction equipment. This is intended to ensure that forest roads are constructed to a high standard enabling rapid movement of logging trucks. Initial investment covers the cost of one large bulldozer (270 FWHP), one smaller tractor (65 FWHP) three dumptrucks (6 cu. yds) one front loader (170 FWHP) and one grader. There is also one self-propelled drillrig, one rock crusher and one pile driver. Additional gravel trucks are added in 1981 as the road network increases.

The logging operations require 4 skidders (180 FWHP) in 1977 with an additional two in 1981. One loader and three logging trucks are required in 1977 with one additional loader and two more trucks in 1981.

The equipment required for the sawmill unit is described in Chapter 10 and relates to the basic sawmill unit recommended by FAO.[112] It is proposed that this unit is phased to build up to full output on two shift operation of the line during 1980 increasing to two lines with two shift working in 1981. Kiln drying facilities are included in the cost enabling the production of quality sawnwood which commands high prices on the world market.

15.3.4 Revenue from Timber Sales

The total expected revenue from timber sales is related here to the additional investment within the region. For purposes of evaluation it is assumed that the output of logs from the Kemaman forest reserve area is sold as round timber and no allowance is made for further value added on this output. The revenue from the total estimated output of logs and sawnwood in the region is given below in Table 15.22.

The total estimated output of logs not processed in the new sawmill unit is assumed sold out of the area at $90 per ton. The total revenue from timber sales drops rapidly as the output from land clearance decreases. The increase in value added within the region from higher production of quality sawnwood however redresses the balance to some extent. Although the total annual volume of logs produced is estimated to fall 66 percent between 1975 and 1990 the total revenue from all sales falls less rapidly.

Table 15.22 Revenue from Log Sales and Sawnwood

	Total Output Logs	Logs Sold	Revenue from Log Sales	Output of Sawnwood	Revenue from Sawnwood	Total Revenue
	000 tons	000 tons	$'000	000 tons	$'000	$'000
1975	491	491	44,190	Nil	Nil	44,190
1976	580	580	52,200	Nil	Nil	52,200
1977	294	289	26,010	2,800	532	26,542
1978	254	244	21,960	6,000	1,200	23,160
1979	224	199	17,910	15,000	4,200	22,110
1980	216	171	15,390	27,000	7,830	23,220
1981	217	129	11,610	52,800	15,840	27,450
1982	212	124	11,160	52,800	15,840	27,000
1983	195	105	9,450	54,000	16,200	25,650
1984	186	96	8,640	54,000	16,200	24,840
1985	175	85	7,650	54,000	16,200	23,850
1986	163	73	6,570	54,000	16,200	22,770
1987	162	72	6,480	54,000	16,200	22,680
1988	164	74	6,660	54,000	16,200	22,860
1989	164	74	6,660	54,000	16,200	22,860
1990	164	74	6,660	54,000	16,200	22,860

15.3.5 Operating Costs

The operating costs estimated are for the new Complex in the Dungun Forest reserve area. The costs, calculated on a tonnage basis, relate to the highly mechanised operation proposed. In the cash flow presented in Table 15.25, they are applied to the total tonnage of logs produced from the complex in order to provide an estimate of the total costs and returns to logging within the area.

The operating costs used are set out in Table 15.23. They are derived from cost estimates used in FAO projections for the Bintulu Forest Complex in Sarawak. (113) and modified for Trengganu Tengah conditions.

Table 15.23 Estimated Annual Logging Costs, Dungun Complex

	Fell Debark & Buck (Contract)	Skid	Load	Haul	Road Construction and maintenance	Overheads	Contingencies	Royalties tribute	Total
				$ per ton					
1976–80	2.0	8.0	1.0	6.5	5.0	17.0	4.0	13.4	56.9
1981–85	2.0	8.0	1.0	7.0	6.0	10.0	4.0	13.4	51.4
1986–90	2.0	8.0	1.0	7.0	7.0	8.0	4.0	13.4	50.4

Felling, debarking and bucking preferably in that order is best done on contract by a five man double team who supply their own tools. Trees should be felled and lopped at the crown point by a two man team for extraction full length if possible. Debarking is best done by a 3 man team in the forest to provide employment for unskilled labour, lessen the load and reduce waste disposal problems at the mill. Bucking, when required, is best done after debarking as this helps inspection by the qualified scalers and also lengthens the life of the sawchain. The contract rate is estimated @ $2.00 per ton and output 40 tons per day, 250 days a year.

Skidding by full tree length is proposed by crawler tractors of 180 Flywheel Horsepower fitted with angle bulldozer blades, winches and integral arches. They should build their own skid trails and keep the front end of the logs off the ground. A crew consists of four men. The maximum skid distance is 40 chains with an average of 20 chains and a productivity of 60 tons a day. The estimated cost is $8.00 per ton.

Loading will be by rubber tyred articulated front-end loaders equipped with log forks, of approximately 170 flywheel horsepower, a lift capacity of 9 tons and a reach of 10 feet. The operational cost is estimated at $1.00 per ton.

Haulage costs of \$6.50 per ton are estimated on the assumption that the public road will not be used for the first 20 years and five axled pole-type trailer trucks with MPLW of 30 tons and a payload of 22.5 tons will be used. The haulage cost per ton rises marginally after the early years of harvesting as length of haul increases.

Road Construction and Maintenance

In order to speed the transportation of logs to the sawmill it is essen tial to have have high quality roads. Fortunately in Trengganu Tengah there should be no shortage of stone. Costs for construction and maintenance can vary greatly but it seems unlikely that they will exceed \$9 per ton of timber extracted at any time and are expected to be between \$5 and \$7 per ton.

Salaries and Overheads

These will be heavy in the early stages of development. These costs include all salaries, wages and bonus payment as well as other fringe benefits and social security payments. Also included are the annual costs of repairs and maintenance not already covered under specific heads.

The basis of costing applied to the remainder of the output from the other forest areas is similar to the above but road construction costs and overheads are reduced by 33 percent. The resultant annual logging cost is shown in Table 15.24.

Table 15.24 Estimated Annual Logging Costs on Other Areas

	Fell Buck Debark	Skid and Load	Haul	Road Maintenance	Overheads and Contingencies	Royalties and Tribute	Total
				\$ per ton			
1975–90	2.0	9.0	7.0	4.0	10.0	13.4	45.4

15.3.6 Cash Flow

The cash flow for the Dungun Forest Complex is set out in Table 15.25. The revenue and operating costs are derived from Tables 15.22 and 15.23. The royalty payments are based on the latest rates paid in Trengganu in 1973 which were \$12.20 per ton for Royalty and Premia and \$1.20 for Tribute payments. A notional interest charge of 10 percent is levied on the average annual capital employed before allowing for taxation.

Table 15.25 Cash Flow, Logging and Sawmilling – Dungun Forest Complex

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
							$'000									
Gross Revenue			532	1,200	4,200	7,830	15,840	15,840	16,200	16,200	16,200	16,200	16,200	16,200	16,200	16,200
Less Royalty + Premia			61	122	305	549	1,074	1,074	1,098	1,098	1,098	1,098	1,098	1,098	1,098	1,098
Tribute			6	12	30	54	106	108	108	108	108	108	108	108	108	108
Logging Operating Costs			285	569	1,423	2,561	4,523	4,523	4,626	4,626	4,626	4,536	4,536	4,536	4,536	4,536
Sawmill Operating Costs			359	510	878	1,688	3,376	3,376	3,376	3,376	3,376	3,376	3,376	3,376	3,376	3,376
Net Revenue			– 179	–13	1,564	2,978	6,761	6,761	6,992	6,992	6,992	7,082	7,082	7,082	7,082	7,082
Capital Expenditure																
Logging		–2,667	1,750	–	10	–	4,510	1,760	–	–	10	4,510	1,750	10	–	–
Sawmill		–1,600	–	1,000	300	2,600	–	300	300	–	300	300	–	300	300	–
Gross Cash Flow		–4,267	–1,929	–1,013	1,254	378	2,251	4,201	6,692	6,692	6,682	2,272	5,332	6,772	6,782	7,082
Interest Charges (before tax)		213	544	746	809	808	757	485	–	–	–	–	–	–	–	–
Net Cash Flow		–4,480	–2,473	–1,759	445	– 430	1,494	4,216	6,692	6,992	6,682	2,272	5,332	6,772	6,782	7,082
Cumulative Balance at end of year before tax		–4,480	–6,953	–8,712	–8,267	–8,697	–7,203	–2,987	3,705	10,697	17,379	19,651	24,983	31,755	38,537	45,619

The Internal Rate of Return is 29%.

Table 15.26 Logging and Sawmilling Net Revenue Statement – Trengganu Tengah

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
							$'000									
Total Revenue	44,190	52,200	26,542	23,160	22,110	23,220	27,450	27,000	25,650	24,840	23,850	22,770	22,680	22,860	22,860	22,860
Royalty + Premia	5,990	7,076	3,586	3,099	2,733	2,635	2,647	2,586	2,379	2,269	2,135	1,989	1,976	2,001	2,001	2,001
Tribute	589	696	353	305	269	259	260	254	234	223	210	196	194	197	197	197
Operating Costs																
Logging	22,291	26,332	13,406	11,647	10,458	10,324	10,380	10,153	9,393	8,984	8,485	7,850	7,805	7,896	7,896	7,896
Dungun Complex	–	–	359	510	878	1,688	3,376	3,376	3,376	3,376	3,376	3,376	3,376	3,376	3,376	3,376
Net Revenue	15,320	18,096	8,838	7,599	7,772	8,314	10,787	10,631	10,268	9,988	9,644	9,359	9,329	9,390	9,390	9,390
Interest Charge	2,259	3,095	1,949	1,843	1,635	1,667	1,758	1,735	1,648	1,607	1,556	1,501	1,496	1,505	1,505	1,505
Balance	13,061	15,001	6,889	5,756	6,137	6,647	9,029	8,896	8,620	8,381	8,088	7,858	7,833	7,885	7,885	7,885

The total revenue from all forestry operations is estimated in Table 15.26. Applying a notional interest charge of 10 percent to total estimated capital employed, it is possible to give an indication of the scope for raising public sector revenues from this source. The total capital employed in other logging operations is assumed to be related to total output in the same proportions as the Dungun Logging Complex but reduced by a factor of 0.67. The notional interest charge is based on a presumed constant capital investment in the Dungun Complex from 1981 onwards and on a declining capital base in residual logging operations from 1977.

15.3.7 Economic and Financial Returns

The returns to land from timber production do not compare favourably with those from high value agricultural crops like oil palm. The long period of production inevitably results in a low annual return per acre of land. Allowing a return to capital of 10 percent and after costing labour at $6 per day the return to each acre of land from logging and sawmilling is $11.6 per year over 15 years on the assumption of a total effective area of 204,525 acres.

The returns to Capital from logging and sawmilling are high at the price levels assumed in this Report. excluding the cost of housing and duties the return to capital invested in the Dungun Complex is 34 percent over 15 years. Deducting the cost of housing at the inflated cost of $6,000 per unit reduces the rate of return to 29 percent while deducting the costs of royalty premium payments and tribute reduces the return further to 24 percent. This is however still a highly attractive rate of return.

Returns to labour employed in logging and sawmilling are also very high. Allowing a 10 percent return to capital but excluding royalty payments produces a return to labour of $30 per day which is almost double that for oil palm. Deducting the cost of royalties and allowing a return to capital of 7 percent reduces the return to labour to $25 per day. This still remains a very high return to labour.

Reference to Table 15.26 shows that a significant increase in State revenue would be possible from the forestry sector before returns to capital employed fall below 10 percent. It is thus possible for Government to consider raising tax revenues substantially provided that timber prices do not remain at the currently depressed levels.

It is pertinent to note that the rate of return on the complex is sensitive to a fall in timber prices. If the price of timber produced from the proposed complex falls by 20 percent the Internal Rate of Return falls from 24 percent to 8 percent after deducting the costs of housing, duties and labour at unchanged rates. If the cost of royalties and duties is excluded from the calculation the return falls from 29 percent to 15 percent.

15.4 Industrial Economics

15.4.1 Introduction

The Consultants' proposals for industrial development in Trengganu Tengah are based on the primary processing of agricultural and forestry products. The economic analysis of these proposals is set out in Chapter 10 of this report as the analysis forms an essential part of the discussion on commodity processing.

This section contains an analysis of the regional benefits resulting from the centralisation of palm oil mills in addition to the detailed analysis presented in Chapter 10. The economic effects of the proposals for processing rubber and timber are also outlined and a summary table of total industrial investment is included at the end of this section.

15.4.2 Palm Oil Processing

The Consultants' recommendations for the processing of oil palm in Trengganu Tengah have been covered in detail in Chapter 10 of this Report. In discussing the concept of centralised milling it was necessary to consider the economic implications of the proposals. It is not proposed to repeat the economic analysis in this section and the interested reader is referred to Chapter 10, Section 10.2.5. This section makes an assessment of the regional economic benefits resulting from centralised milling with particular emphasis in the savings in capital costs.

The proposed additional investment in palm oil mills is set out in Table 10.7. An estimate of the total savings in capital costs from centralised milling is obtained by comparing this total investment with the estimated capital cost of decentralised mills according to the revised phasing set out in Table 15.27.

Table 15.27 Revised Phasing of Decentralised Palm Oil Mills(1)

Mill Group	III					V			VI	
Block	111	13	16	17	19	113	23	24	25	119
	Installed capacity: tons/hr. ffb									
1975	–	–	–	–	–	–	–	–	–	–
1976	–	–	–	–	–	–	–	–	–	–
1977	–	–	–	–	–	–	–	–	–	–
1978	–	–	–	–	–	–	–	–	–	–
1979	–	–	–	–	–	–	–	–	–	20
1980	20	–	–	–	–	–	–	–	–	20
1981	20	–	20	–	20	20	–	–	20	20
1982	40	–	20	20	20	20	20	–	20	20
1983	60	20	20	20	20	20	20	20	20	20
1984	60	20	20	20	20	20	20	20	20	20
1985	60	20	20	20	20	20	20	20	20	20

(1) Phasing of mills I, II, IV, VII, VIII, IX unchanged from Table 10.6.

Table 15.28 indicates the total capital costs saved within the region as a whole through the adoption of centralised palm oil milling. Savings in costs relate to mill construction and investment in transport equipment. The total planted acreage affected by the decentralised milling alternative would be that serving mills III, V and VI which amounts to 64,500 planted acres representing approximately 40 percent of the estimated total planted oil palm acreage during the period (Table 8.36).

For purposes of the analysis it is assumed that if decentralised mills were adopted by some individual growers this would not apply to group schemes such as FELDA. It is therefore assumed for comparative purposes that investments in Mills I, II, IV, VII, VIII and IX would remained unchanged. Areas 111 and 13 would be served by two mills instead of the single large mill proposed. The mill to serve Area 111 operated by RISDA would have to remain at the projected capacity of 60 tons per hour. In addition a 20 ton per hour mill would be required on block 13 by 1983 which would necessitate investment expenditure in 1981 and 1982. Similarly the single mill proposed at Community D to serve blocks 16, 17, 19 and 113 would be replaced by four separate mills each with capacity of 20 tons per hour. Initial investment for three of these mills would be required in 1979 and for the fourth in 1980. The additional investment required for the Group VI mill at Community E has been detailed in Chapter 10 (Section 10.2.5).

The additional cost of vehicles to serve centralised mills is estimated at $6 per acre developed. This is calculated for each estate on the total planted acreage in Year 6.

Table 15.28 Trengganu Tengah: Total Capital Cost Savings from Centralised Palm Oil Mills

	1975–77	1978	1979	1980	1981	1982	1983	1984–90	Total 1975–90
Capital Costs ($'000)									
Decentralised mills	–	400	14,012	26,824	15,484	17,460	–	–	74,180
Centralised mills	–	400	13,412	6,606	2,208	7,656	8,496	–	38,778
Costs saved	–	–	600	20,218	13,276	9,804	–8,496	–	35,402
Additional field investment for centralised milling	–	–	–	153	114	60	60	–	387
TOTAL SAVINGS	–	–	600	20,065	13,162	9,744	8,556	–	35,015

In addition to the savings in capital costs resulting from centralising palm oil mills, there will also be savings in operating costs as indicated in Chapter 10 (Section 10.2.5). The largest total saving will be in labour costs although smaller savings will be possible in mill materials and palm oil and kernel transportation. It is estimated that the additional mills required to implement a decentralised system would require a net increase of 327 in the labour force at full production on two shift operation. The number of managerial and skilled personnel required to operate the additional mills would rise from 84 to 199 imposing a severe strain on the limited supply of these people in the years 1980 to 1985.

15.4.3 Other Processing

The economics of rubber production and processing have been examined in detail in Section 15.2.2 of this chapter. The investment required in rubber factories is tabulated in Chapter 10 (Table 10.13). The scale of investment is much lower than that needed for oil palm. The employment potential of rubber processing is also much less than for oil palm milling. Despite this the annual value added from processing the production of Bukit Besi Estate should amount to $975,000 by 1990 which can be considered a worthwhile contribution to the regional economy. It is doubtful, however, whether rubber production in Trengganu Tengah will develop sufficiently during the planning period to form the base for further manufacturing activities.

The economics of timber processing have been dealt with under Section 15.3. The investment in timber processing recommended by the Consultants is described in Chapter 10 (Section 10.4). The evaluation in this Report does not relate to the proposed Romanian Complex as details of this scheme have not been made available. The possibility of adding a pre-fabricated housing plant to the sawmill has been mentioned in Chapter 10. The investment cost of this unit has not however been incorporated in the investment schedule shown in Table 15.29.

The possibility of footloose industries locating in Trengganu Tengah has been discussed in Chapter 10 (Section 10.5). The Consultants do not think there will be any significant industrial development of this type in the region during the period 1975 – 1990 due to the lack of infrastructure and skilled manpower during the early years of development.

15.4.4. Investment in Industrial Plant

The capital costs of the various processing facilities have been itemised in Tables 10.7, 10.13 and 10.16. These are combined in Table 15.29 to show the total investment required in the planned primary processing facilities to be located within Trengganu Tengah.

In the planning of activities it is emphasied that priority be given to those projects generating the greatest benefits. It is recommended that priority be given to initiating the feasibility study for further timber processing and manufacturing.

Completion of the road network is crucial to the successful operation of these industrial plants. If completion of the road is delayed beyond 1977 the processing activities will also suffer a delay in implementation.

Table 15.29 Trengganu Tengah: Investment in Processing Facilities, 1975 – 1990

Year	Palm Oil Mills	Rubber Factories	Sawmills	Total
		$'000		
1975	8,036	–	–	8,036
1976	6,606	–	1,600	8,206
1977	200	1,310	–	1,510
1978	8,878	–	1,000	9,878
1979	13,412	–	–	13,412
1980	11,190	420	2,600	14,210
1981	3,744	–	–	3,744
1982	11,904	–	–	11,904
1983	8,496	840	–	9,336
1984	–	–	–	–
1985	200	–	–	200
1986	6,300	1,310	–	7,610
1987	306	–	–	306
1988	–	–	–	–
1989	336	–	–	336
1990	–	–	–	–
	79,608	3,880	5,200	88,688

15.5 The Investment Programme

15.5.1 Capital Costs

The development of Trengganu Tengah requires substantial. capital investment. The total estimated capital expenditure on agricultural production is shown in Table 15.30. The largest element of capital cost in establishing agricultural estates in Malaysia is normally housing. This is excluded from Table 15.30 because the plan proposes that housing is located in central communities. All housing costs are therefore included in Table 15.31 under the sub-heading of housing rather than under primary agricultural production.

The field costs relate to the costs of crop establishment and administrative buildings, vehicles and other equipment. Certain additional operating costs will be incurred before revenue is received but these items have not been included in the estimate.

The capital investment required between 1975 and 1990 is shown in Table 15.31. The investment relates to primary agricultural production and processing, timber extraction and sawmilling and the major infrastructural costs including roads, housing and public services.

The level of expenditure on housing and other infrastructure is high as mentioned in Chapter 13. The Consultants believe, however, that attractive facilities must be provided within Trengganu Tengah in order to encourage migration of the magnitude required. The total capital cost of housing, roads and other infrastructure represents approximately 68 percent of the total capital cost of all investment during the period. It is possible to break this total down into those components which are essential expenditure irrespective of development in Trengganu Tengah and those which are incurred directly as a result of development. Within the total budgetted capital expenditure in Table 15.31, the additional development costs are estimated to include the total cost of the main highways ($73.0 million), and one third of the costs of housing ($41.5 million) and electricity and water supply ($14.5 million). The costs for housing and services have been increased by 50 percent over standard costs to allow for the additional costs of locating in Trengganu Tengah rather than in existing communities elsewhere in the State. A rough estimate of the added capital costs relating to housing and other infrastructure thus amounts to $129 million.

Reference to Table 15.31 shows that over half the total investment expenditure is incurred during the six year period (1975 – 1980). This reflects the very rapid development of a large agricultural area together with the cost of the major Jerangau-Jabor highway. During the second and third five year periods the capital costs are more evenly phased. In the 1980's more emphasis is placed on community infrastructure as non-primary population rises and more sophisticated infrastructural services are required.

Table 15.30 Trengganu Tengah: Field Investment Expenditure, 1975 – 1990 at 1974 Prices

	Total Expenditure in Period			Total
	1975–80	1981–85	1986–90	1975–90
	$'000			
Oil Palm Projects [1]				
FELDA	5,916	2,621	2,736	11,273
RISDA	4,737	–	–	4,737
FELCRA	1,144	120	–	1,264
Private	11,142	1,981	–	13,123
Sub-total	22,939	4,722	2,736	30,397
Rubber Projects [1]				
SEDC	968	–	–	968
Private	–	1,364	522	1,886
Sub-total	968	1,364	522	2,854
Grass Production [2]	1,814	–	–	1,814
GRAND TOTAL	25,721	6,086	3,254	35,065

[1] Excluding housing costs.

[2] Includes housing costs.

Table 15.31 Trengganu Tengah: Sectoral Capital Expenditure, 1975 — 1990 at 1974 Prices

Sector	Total expenditure in period 1975–1980	1981–1985	1986–1990	Total expenditure 1975–1990
	$'000			
Primary agricultural production [1]				
Oil palm	22,939	4,722	2,736	30,397
Rubber	968	1,364	522	2,854
Grass	1,814	–	–	1,814
Sub-total	25,721	6,086	3,258	35,065
Agricultural processing				
Grass	5,320	–	–	5,320
Oil palm (ffb)	48,322	24,344	6,942	79,608
Rubber	1,730	840	1,310	3,880
Sub-total	55,372	25,184	8,252	88,808
Forestry production and processing	9,620	1,850	–	11,470
Public highways	65,000	8,000	–	73,000
Housing				
Estate housing	29,148	14,075	6,580	49,803
Community housing	30,492	21,425	24,090	76,007
Sub-total housing	59,640	35,500	30,670	125,810
Other Infrastructure				
Urban roads	3,678	2,190	1,890	7,758
Water supply	11,058	5,935	5,555	22,548
Electricity supply	10,212	5,840	5,200	21,252
Health services	3,288	1,705	1,240	6,233
Educational facilities	5,460	6,965	6,705	19,130
Other community services	3,342	1,175	950	5,467
Sub-total Infrastructure	37,038	23,810	21,540	82,388
GRAND TOTAL	252,391	100,430	63,720	416,541

[1] Excludes the cost of housing which is included under separate heading.

15.5.2 Financing Capital Expenditure

In order to guide those in the public sector concerned with development implementation in Trengganu Tengah an estimate has been made of the total capital investment requirement. This is set out in Table 15.32.

During the first period of six years public sector investment accounts for approximately 79 percent of total financing. In the second and third development periods the proportional share of public sector investment declines marginally to 77 percent and 76 percent respectively. Non-recoverable public sector investment amounts to $110 million during the whole period which is 34 percent of total public, sector capital expenditure up to 1990.

It is likely that the recoverable capital costs relating to agricultural and forestry production and processing by public sector bodies will be funded through existing public and private sector media. Financial analysis in Sections 15.2 to 15.4 shows that returns to oil palm and forestry investment are very good at current prices although returns from rubber are less attractive.

It is recommended that the centralised palm oil mills are financed by a new Oil Palm Milling Corporation which should be set up to operate them after the results of the recommended feasibility study are made available. Pending the outcome of the study the following assumptions have been made regarding finance. The Development Authority (LKTT) and the SEDC should hold 15 percent of the equity divided equally between them. The remaining 85 percent should be divided between growers of oil palm in proportion to their acreage such that the largest individual estate has fewer shares than the combined LKTT/SEDC holding. According to acreage entitlements the largest individual estate would, in this case, hold 12.75 percent of the equity. The total holding by public sector estates would be 51 percent of the issued capital. Adding the 15 percent held by the LKTT and SEDC the balance of 34 percent would be in the hands of private producers.

It is probable that the total milling operation will be able to attract and service considerable loan capital, possibly from international agencies. Such gearing would reduce the direct drain on public sector funds while also increasing the net return to the basic equity investment.

Table 15.32 Trengganu Tengah: Financing of Capital Expenditure, 1975 – 1990

	Total funding in each period			Total funding
	1975–1980	1981–1985	1986–1990	1975–1990
	$'000			
Primary Agricultural Production				
FELDA	5,916	2,621	2,736	11,273
RISDA	4,737	–	–	4,737
FELCRA	1,144	120	–	1,264
SEDC	968	–	–	968
Private and other	12,956	3,345	522	16,823
Sub-total public sector	12,765	2,741	2,736	18,242
Agricultural Processing				
OPMC Public sector finance (1)	31,893	16,067	4,582	52,542
OPMC Private sector finance (1)	16,429	8,277	2,360	27,066
Rubber factories public sector finance	1,730	840	–	2,570
private sector finance	–	–	1,310	1,310
Grass processing: private sector (2)	5,320	–	–	5,320
Sub-total public sector	33,623	16,907	4,582	55,112
Forestry production and processing – public sector	9,620	1,850	–	11,470
Infrastructure: public sector	142,466	55,620	41,060	239,146
private sector	19,212	11,690	11,150	42,052
GRAND TOTAL Private Sector Expenditure	53,917	23,312	15,342	92,571
GRAND TOTAL Public sector expenditure	198,474	77,118	48,378	323,970
of which: Recoverable expenditure	118,804	57,293	37,793	213,890
Non-recoverable expenditure	79,670	19,825	10,585	110,080

(1) Oil Palm Milling Corporation (Trengganu Tengah). Public/private sector finance related to acreage. See text.

(2) LKTT will have a 50 percent interest in Grass Protein Project.

15.5.3 Financing Public Sector Operating Costs

An estimate is included here of the average annual cost of maintaining and operating various public sector infrastructural facilities. Table 15.33 sets out the average annual costs relating to non-recoverable capital expenditures. The average annual cost builds up to $27 million by 1990. By way of comparison Table 15.34 indicates the extent of the contribution to annual Federal Government revenue from taxes and duties levied on production within Trengganu Tengah.

Excluding the cost of servicing capital, the total public sector revenue from indirect taxes and duties is somewhat higher than the annual operating costs incurred by public bodies involved in providing infrastructural facilities.

On the assumption, however, that these local annual costs are met by local revenue, it is possible to estimate the required levels of annual per capita charges and taxes. If the total urban services charges in 1990 (Table 15.33) are collected from the individual householders, this represents an annual charge of $419 per household, based on an estimated 15,712 households as calculated according to the breakdown of public and private sector housing given in Footnote 2 in Table 13.14. The additional costs for operating other public services amounting to $20,951,000 would represent a tax of $156 per head levied on the total 1990 Trengganu population.

Assuming the recommended wage of $6 per day is adopted the average family gross income will be $2,574 per year by 1990. Given that each family contributes $419 towards the cost of housing services there is little extra capacity for financing other public sector costs from earned income. The balance must come from State or Federal sources. Reference to Table 15.34 indicates however that this does not imply a net transfer of resources into the region.

Table 15.33 Annual Public Sector Operating Expenditure

	Average Annual Non-recoverable Expenditure 1975–80	1981–85	1986–90
	$'000		
Estate housing maintenance	160	398	512
Community housing maintenance	1,244	618	844
Urban road maintenance	92	239	341
Water supply	672	1,723	2,446
Electricity supply	654	1,706	2,442
Sub-total urban services	1,822	4,684	6,585
Highway maintenance	200	600	675
Health services	714	1,521	1,996
Education	5,588	10,776	18,280
Other services		Not estimated	
Total Infrastructure Operating Costs	8,324	17,581	27,536

Table 15.34 Average Annual Revenue from Indirect Taxes and Duties

	Average annual revenue 1975–80	1981–85	1986–90
	$'000		
Agriculture			
Oil palm	6,842	16,595	20,850
Rubber	615	2,469	3,379
Forestry			
Royalties	4,598	2,639	2,190
Mining	2,100	2,100	2,100
Total	14,155	23,803	28,519

15.6 Economic Evaluation

15.6.1 Regional Output

The volume of total production from the major economic sectors is set out in Table 15.35. The gross output is the estimated volume of primary production multiplied by the constant 1974 prices used in this study. The quantity of palm oil and kernels produced is derived from Table 8.38 which estimates the total production within the region including that from areas developed in earlier years. The price is that of $600 per ton of palm oil and $400 per ton of palm kernels.

The estimated volume of rubber produced is detailed in Table 8.39. The price applied to derive total volume is 60 cents per pound.

The revenue from cocoa is derived from the volume of production given in Table 8.40 at a constant price of $2,500 per ton of dry cocoa. The value of grass pellets and leaf protein concentrate produced is derived from output phased according to the acreage development set out in Table 8.34 with an estimated output of 1.12 tons of L.P.C. per acre per year selling at $1,075 per ton and 8.93 tons of grass pellets selling at $270 per ton.

The value of timber output is based upon volume estimates and prices from Table 15.22. The value of output from mining activities is based upon estimated output of 15,000 piculs of tin worth $1,000 per picul. This constant output is somewhat arbitary but assumes lower output than in 1973 and a lower price than that currently ruling. It does, however, imply that new workings will be opened up as production from the existing ones declines.

The value of other crops and smallholder production has been excluded from these estimates. The return from the diversification proposals cannot be reliably estimated until the results of the recommended trials are made available, indicating yields sustainable under Trengganu conditions. Although not large, the contribution of these crops to total revenue could however be significant by 1990. Copra production could provide gross revenue of $6.9 million. On the basis of the yield estimates for minor crops set out in Table 8.44 the value of output from these sectors could well be of the order of $10 million per year by 1990.

It is apparent from Table 15.38 that in the early years of development the output of logs from the clear felling of agricultural development areas represents a substantial proportion of the total value of all sectoral output. However as agricultural output rises and log output falls so the value of timber production falls from 44 percent of total output in 1975 to 9 percent by 1990.

Table 15.35 Trengganu Tengah: Gross Sectoral Output, 1975 – 1990

	Agriculture							
	Oil palm	Rubber	Cocoa	Grass	Sub-total Agriculture [1]	Timber	Mining	Total Primary Sectors
	$'000							
1975	42,805	1,915	975	1,011	46,706	44,190	15,000	105,896
1976	48,018	1,982	1,125	2,628	53,753	52,200	15,000	120,953
1977	51,559	2,009	1,275	4,347	59,190	26,542	15,000	100,732
1978	56,418	3,095	1,425	6,065	67,003	23,160	15,000	105,163
1979	64,115	5,018	1,575	10,109	80,817	22,110	15,000	117,927
1980	78,332	7,822	1,725	10,109	97,988	23,220	15,000	136,208
1981	97,989	11,284	1,875	10,109	121,257	27,450	15,000	163,707
1982	120,719	13,716	2,025	10,109	146,569	27,000	15,000	188,569
1983	143,326	15,241	2,125	10,109	170,801	25,650	15,000	211,451
1984	159,345	16,197	2,238	10,109	187,889	24,840	15,000	227,729
1985	168,376	16,717	2,450	10,109	197,652	23,850	15,000	236,502
1986	171,119	16,960	2,838	10,109	201,026	22,770	15,000	238,796
1987	171,518	17,691	3,108	10,109	202,426	22,680	15,000	240,106
1988	172,701	19,255	3,315	10,109	205,380	22,860	15,000	243,240
1989	174,860	21,833	3,500	10,109	210,302	22,860	15,000	248,162
1990	176,424	24,416	3,670	10,109	214,619	22,860	15,000	252,479

(1) Excluding small farming sector.

Table 15.36 Trengganu Tengah: Primary Sector Output and Employment, 1975 – 1990

	1975			1980	1985	1990		
	Gross Output	Direct Employ-ment	Gross Output per Head	Gross Output	Gross Output	Gross Output	Direct Employ-ment	Gross Output per Head
	$'000		$	$'000	$'000	$'000		$
Agriculture								
Oil palm	42,805	4,089	10,468	78,332	168,376	176,424	11,951	14,762
Rubber	1,915	1,554 (1)	1,232 (1)	7,822	16,717	24,416	4,268	5,721
Cocoa and grass	1,986	262	7,580	11,834	12,559	13,779	593	23,236
Other crops & small farming	4,395	4,395	1,000 (2)	8,422	12,449	16,476	8,238	2,000
Sub-total agriculture	51,101	10,300	4,961	106,410	210,101	231,095	25,050	9,225
Forestry	44,190	500	88,380	23,220	23,850	22,860	1,000	22,860
Mining	15,000	500	30,000	15,000	15,000	15,000	500	30,000
GRAND TOTAL	110,291	11,300	9,760	144,630	248,951	268,955	26,550	10,130

(1) Includes contract labour.

(2) Estimated residual output of $1,000 per head.

15.6.2 Economic Evaluation of the Development Plan

As a significant amount of development has been effected prior to the existence of a development plan and additional projects are in process of implementation it is not easy to identify the benefits and costs relating directly to the proposals put forward in this report.

The total output from both existing and proposed projects in the primary sectors is set out in Table 15.36 and related to the employment in the year quoted in each sector. These productivity figures must however be treated with caution as they are subject to certain biases. For instance, the gross output per man from forestry is very high in the early years due to the very high value of output per man from logging operations. The estimated employment, which is related to the 1970 census figure, excludes the contract labour employed which may well be substantial during the period 1975 — 80 amounting to an additional 1,500 men. If this were the true position the gross output per man would be approximately $22,000. This would be very similar to the projected 1990 productivity.

Total output per head is likely to rise by over 80 percent during the period for all agricultural sectors against a rise of only 4 percent for all primary sectors. If the grass processing project is successful this highly capital intensive operation will achieve a very high productivity per person employed. Most important, in terms of total regional productivity however, is oil palm due to the fact that by 1990 it will contribute over 75 percent of the total value of all agricultural production within the region. Productivity per person in oil palm is likely to rise by 40 percent during the period as increasing areas reach maturity and output rises.

The value of output from other sectors including small farmers will depend upon the success of diversification schemes as well as the adoption of modern techniques by existing smallholders. It is possible that productivity in this sector may rise by more than 100 percent during the 16 years to 1990.

A more accurate measure of productivity is gained by comparing value added in the production of different commodities. The value added during production of the three most important commodities is shown in Table 15.37. The sectoral productivity shown in this table is derived from Tables 15.5 for oil palm, 15.11 for rubber and 15.25 for logging and sawmilling.

The superior productivity of labour in timber production and oil palm over rubber is clear from the figures to Table 15.37. Assuming an average of 1.43 workers per family, the average value added per family engaged in oil palm production would be $16,695 per year by 1990.

On the basis of 4.3 persons per family the value added per head by 1990 from this sector is $3,882 which is significantly higher than the highest average rate currently estimated for Trengganu State as a whole. Similarly with timber production value added would exceed $4,843 per head assuming only one worker per family.

Rubber growing and processing is however much more labour intensive with the result that value added per head averages only $1,409 by 1990. On the pricing assumptions used in this report the growing of rubber is only recommended on land unsuitable for oil palm.

Table 15.37 Productivity by Sector Developed during the Period, 1975 – 1990

	1975	1980	1985	1990
Oil Palm Production and Processing				
Value added ($'000)	–13,642	4,068	103,378	115,442
Direct Employment	631	4,062	8,943	9,888
Value added per employee $	–	1,001	11,560	11,675
Rubber Production and Processing				
Value added ($'000)	– 1,073	3,060	11,474	17,935
Direct Employment	95	1,316	2,687	4,233
Value added per employee $	–	2,325	4,270	4,237
Logging and Sawmilling				
Value Added ($'000)	–	4,274	9,593	9,683
Direct Employment	–	231	465	465
Value added per employee $	–	18,502	20,630	20,824

Table 15.38 sets out the returns to the principal factors of production given assumptions regarding the return to the residual factors in each case.

Returns to labour have been calculated for each of the three sectors given two rates of return to capital, in the one case allowing for the deduction of duty payments and in the other excluding duties. The target income figure of $6 per man day is easily reached in the case of both oil palm and timber allowing 10 percent return to capital. In the case of rubber however the target income figure of $6 is only attainable if a return to capital of around 5 percent is considered acceptable or, if the actual price of rubber is above that estimated, or if export taxes are reduced.

Returns to land have been estimated after allowing returns to capital of 10 percent and 12 percent and deducting $6 per day for labour, but not allowing for the payment of taxes and duties. Given a 10 percent return to capital, including the full cost of housing and charging labour at $6 per day, there is a positive present value to land for each commodity. The return to land from oil palm is, however, vastly higher than from rubber or forestry. Raising the return to capital to 12 percent lowers the return to land from forestry only marginally but converts the positive return from rubber to a negative value. The returns to forestry land are not strictly comparable as the acreage has been apportioned on the arbitary basis of a 25 year cycle while the agricultural crop returns relate to specific areas discounted back to Year 0. The figures do nonetheless serve as a guide to the choice of alternative land uses. They indicate quite clearly the superiority of oil palm.

Returns to capital have been measured alternatively charging the costs of labour, labour plus housing and labour, housing and duties. In every case, the return to capital is highest from logging and sawmilling. The returns to oil palm are also very attractive in every case. The returns to rubber are adequate if duty payments are excluded but unattractive when all costs are allowed for.

The decision to concentrate on oil palm production in Trengganu Tengah appears economically correct given returns to land as the prime consideration. The returns to all factors are higher for oil palm than rubber which make the latter an unattractive proposition except on agricultural land unsutiable for oil palm. Returns to labour from forestry are very high but the total employment generation is so low that this is not a very meaningful measure in terms of overall regional development.

Table 15.38 Sectoral Returns to Factors of Production

	Palm oil production and processing (25 year period)	Rubber production and processing (30 year period)	Logging and sawmilling (15 year period)
Returns to labour ($ per day)			
Excluding duty payments and allowing 10% return to capital	16.5	4.30	30.2
Including duty payments and allowing 7% return to capital (5% for rubber)	16.4	6.08 (5%)	24.9
Returns to land ($ per acre per year)			
Net of housing, labour at $6 per day			
Capital at 12%	156.0	Negative	10.1[1]
Capital at 10%	206.0	13.0	11.6[1]
Returns to capital (percent)			
Net of labour at $6 per day	21.5	14.9	34.0
Net of labour and housing	18.0	11.0	29.0
Net of labour, housing and duties	16.0	5.3	24.0

(1) Excluding housing costs and assuming 204,525 effective acres.

An attempt has been made in Table 15.39 to overcome the difficulties of identifying benefits and costs with the developments proposed. In order to provide an indication of the return to public and private sector investment certain broad assumptions have been made. The present values of the benefits from additional investments in oil palm, rubber and forestry have been discounted back to 1970 at 10 percent and 12 percent. These have been assumed to be the benefits directly attributable to the development plan. The present values given in Table 15.39 relate to benefits after deducting the cost of labour and purchased inputs but before allowing for housing costs and duties. The cost of housing has been included under the heading of infrastructural costs. Only the additional costs of housing (taken at 50 percent in Trengganu Tengah) and specific infrastructural costs have been included in the estimation of total development costs. The cost of the main highways has however been included in full as the whole of this investment is considered attributable to the development of the region.

Table 15.39 Net Present Values of Development Costs and Benefits 1970 – 1990

Discount Rate	Benefits			Costs		Net Benefits
	Oil Palm Net Revenue	Rubber Net Revenue	Forestry Net Revenue	Infrastructure Capital Costs	Annual Operating Costs	
			$'000			
10%	76,429	86	12,731	56,183	8,730	24,333
12%	47,383	−1,809	9,315	48,505	6,947	− 563

Thus the infrastructural capital costs relate to those costs incurred directly as a result of development. It seems realistic to include the additional or "premium" cost of 50 percent relating to housing which is considered necessary in order to provide facilities good enough to attract migrants into the area. Although better housing in other circumstances can be considered a benefit in its own right this is not valid in Trengganu Tengah where the benefit of better housing must be considered necessary to counter 'costs,' both social and monetary, incurred by migrants moving into the region.

It is also considered that the cost of providing water and electricity will be some 50 percent higher in the region and capital and operating costs have been included to cover this incremental amount.

Discounting the costs and benefits at 10 percent and 12 percent gives cost benefit ratios of 1 to 1.37 and 1 to 0.99 respectively. The internal rate of return is approximately 12 percent.

Bearing in mind the heavy additional investment required in infrastructure in Trengganu Tengah a return of this order can be considered satisfactory although this return relates only to the specific additional costs mentioned above and not to total costs which will be vastly greater.

APPENDIX G

Ideal Community Size Standards

APPENDIX G

IDEAL COMMUNITY SIZE STANDARDS

1. Introduction

The process of determining a settlement pattern for a specific development area is extremely complex. An initial abstract settlement pattern is determined, based on a series of standards taken from similar studies as well as from information on other development areas elsewhere in the country. This information and its subjective conclusions should by their nature be taken only as an indicator of what the final settlement pattern may be, for finite study of a specific area will bring to light much more detailed information of special localized conditions which would not be available at the early stages of study.

The publication on Settlement Pattern in Trengganu Tengah[48] (May 1972) by the Federal Town and Country Planning Department has proved to be a very useful base from which to start working. However, since it was released, major changes in settlement development policy have occurred as a result of findings from the studies in Johor Tenggara and Pahang Tenggara and work by FELDA.

2. Ideal Community Size Standards

Adequate urbanization or community size appears to be the critical factor, in achieving desirable economic and social goals, when dealing with new agricultural development areas.

A community's size depends on a great many factors, some of which will indicate a minimum level and others a maximum level at which a community is likely to function efficiently. These factors, determining community size will be discussed in turn and it should be noted that because they are abstract they should be looked on only as indicators in the final determination of community type, size and placement. They include the following:—

(a) Transport thresholds
(b) Social services thresholds
(c) Commercial thresholds
(d) Processing thresholds
(e) Manufacturing activity and town size.

2.1 Transport thresholds

This analysis, based on Pahang Tenggara studies, is intended to assess the impact of changes in transport mode on the size of the agricultural area served and the number of primary agricultural workers which could, in theory, be served from a single settlement centre. It will determine maximum areas of influence given different methods of transport and modal splits.

There is an underlying assumption that total transport time, including walking time for a worker from his drop-off point to task area should not exceed 30 minutes for any transport mode utilized, which is the critical travel time adopted by FELDA for the design of its settlement areas where workers travel mainly on foot or by bicycle.

The analysis considers the following factors:—

- alternative transport modes
- maximum speed
- modal split
- land/man ratio for agricultural workers

Table G.1 demonstrates the relationship between transport mode and the area which that particular mode will serve. In Table G.2 different combinations of transport mode are analyzed to determine their likely sphere of influence. Table G.4 applies the labour requirements from Table G.3 to individual travel modes to determine the agricultural population which each travel mode can serve.

Table G.1 Transport Mode — Distance and Agricultural Area Covered

Transport Mode	Average Speed (mph)	Maximum[1] Distance (miles)	Maximum[2] Area (sq. miles)	Gross Area Acres	Net Area[3] Class 1+2 Soil	Net Area[4] Class 3+4 Soil
Walk	3	1.5	2.25	1,400	1,200	1,100
Bicycle	8.24	4.12	16.97	11,000	9,000	8,200
Tractor/ Trailer	9.6	4.8	23.04	15,000	12,300	11,200
Scooter	15.6	7.8	60.84	39,000	34,000	29,000
Lorry	18.9	9.45	89.30	57,000	46,700	42,700
Bus	20.4	10.2	104	66,500	54,500	50,000

(1) Assuming maximum travel time of 30 minutes.

(2) Assuming the area described is rectangular.

(3) Class 1+2 soils assume 82% net/gross acres.

(4) Class 3+4 soils assume 75% net/gross acres.

Source: Pahang Tenggara Study Paper No: 51.

Table G.2 Modal Split, Travel Distance, Agricultural Area Covered

	Mode	Maximum Distance Miles	Mode	%	Gross Area Covered (acres)	Net Area Class 1+2 Soils (x.82)	Net Area Class 3+4 Soils (x.75)
S_o	Walk (w)	1.5	w	100	1,400	1,200	1,080
S_1	Walk + bicycle (b)	4.12	w	67	10,000	8,200	7,500
			b	33			
S_2	Bicycle, Scooter (s) + tractor/trailer (T)	7.8	b	11			
			s	11			
			T	78	17,000	13,940	12,750
S_3	Scooter, Tractor/ trailer + lorry (L)	9.45	s	11			
			T	19			
			L	70	57,000	46,740	42,750
S_4	Scooter, Tractor/ trailer, Lorry + bus (B)	10.2	s	11			
			T	15			
			L	60	66,000	54,120	49,500
			B	14			

Source: Pahang Tenggara Study, Paper No: 51.

Table G.3 Labour Requirements for Oil Palm and Rubber

ESTATE

	Acres/family	Direct Labour Acres/worker	Direct Labour Worker/acre	Indirect Labour Acres/worker	Indirect Labour Worker/acre
Oil Palm	–	15	.067	125	.008
Rubber	–	6	.167	100	.01

FELDA/SETTLEMENT SCHEME

	Acres/family	Direct Labour Acres/worker(1)	Direct Labour Worker/acre	Indirect Labour Acres/worker	Indirect Labour Worker/acre
Oil Palm	14	9.7	.10	125	.008
Rubber	12	8.3	.12	100	.10

(1) Assume 1.44 workers/family for FELDA settler.

Source: Trengganu Tengah Study.

Table G.4 Transport Mode as a Determinant of Agricultural Support Population

Transport Mode	Net Area (Acres)	Crop	FELDA [1] Direct Jobs (.1)/.12	FELDA Indirect Jobs (.008).01	FELDA Jobs Total	FELDA Total Families (÷ 1.44)	FELDA Total Agric. Population (x 5.54)	ESTATE [2] Direct Jobs (.67)/.16	ESTATE Indirect Jobs (.008)/.16	ESTATE Jobs Total	ESTATE Total Families (÷ 1.60)	ESTATE Total Agric. Population (x4.55)
Walk	1,100	OP	110	8.8	118.8	82.5	457	73.7	8.8	82.5	51.6	235
		R	132	11	143	99.3	550	183.7	11	194.7	121.7	554
Bicycle	8,200	OP	820	65.6	885.6	615	3,407	549	65.6	614.6	384.1	1,748
		R	984	82	1,066	740	4,100	1,369	82	1,451	906.9	4,126
Tractor/trailer	11,200	OP	1,120	89.6	1,209.6	840	4,655	750.4	89.6	840	525	2,389
		R	1,344	112	1,456	1,011	5,601	1,870	112	1,982.4	1,239	5,637
Scooter	29,200	OP	2,920	233.6	3,153.6	2,190	12,133	1,956.4	233.6	2,190	1,368.8	6,228
		R	3,504	292	2,796	2,636.1	14,604	4,876.4	292.0	5,168.4	2,330.3	14,698
Lorry	42,700	OP	4,270	341.6	4,270	2,965.3	16,428	2,860.9	341.6	3,202.5	2,001.6	9,107
		R	5,124	427	5,551	3,854.9	21,356	7,130.9	427	7,557.9	4,723.7	21,493
Bus	50,000	OP	5,000	400	5,400	3,750	20,775	3,350	400	3,750	2,343.8	10,664
		R	6,000	500	6,500	4,513.8	25,006	8,350	500	8,850	5,531.3	25,167

(1) FELDA

	Workers/acre Direct	Workers/acre Indirect
Oil Palm	.1	.008
Rubber	.12	.01

Average family size = 5.54 @ 1.44 workers/family.

(2) ESTATE

	Workers/acre Direct	Workers/acre Indirect
Oil Palm	.067	.008
Rubber	.167	.01

Average family size = 4.55 @ 1.60 workers/family.

Source: Trengganu Tengah Study.

2.2 Social Service Thresholds

Figure G.1 shows the three broad categories of social services, education, health and community services and indicates individual thresholds based on existing national planning standards. The one exception is education where the planning standards have been projected to 1990 on a national basis. It should be noted that these thresholds apply to single concentrated settlements only and assume no element of hinterland population.

By taking the average condition for all the social services listed in Figure G.1, it is possible to demonstrate four levels of population threshold. These range from minimum to maximum population as follows:–

Level 1	2,000 – 3,500 population
Level 2	8,000 – 12,000 population
Level 3	20,000 – 30,000 population
Level 4	50,000 + population

The minimum proposed settlement size is based on the desirable standards of education, health and community services. The lowest level threshold of 2,000 – 3,000 would have only rudimentary educational and health facilities and few community facilities. To propose any settlements on this scale would mean perpetuating the unsatisfactory settlement pattern with all its faults which now exists in rural Malaysia.

Level 2 communities with a threshold population of 8,000 – 12,000 appear able to satisfy the demand for adequate social services and therefore reduce the gap between rural and urban communities. A Level 2 community would be able to provide primary and lower secondary education facilities, medical health facilities with at least one doctor, a postal agency, a fire station and a police station.

Ideally no communities below that of Level 2 would be recommended assuming all other threshold requirements can be met.

2.3 Infrastructural Service Thresholds

Thresholds for infrastructural services such as water supply, electricity supply and sanitary drainage systems are related to economic sizes and to economies of scale.

For the lowest per capita cost water supply system a town of 20,000 persons is a minimum target taking into consideration both capital expenditure and operating costs. The initial capital cost threshold occurs with a community of 20,000 – 30,000 people while the operating cost threshold occurs between 15,000 and 20,000 persons (Fig. G.2A).

The National Electricity Board indicates that ideally there should be a 5 megawatt demand from a community before it becomes economical to provide an electrical substation for that community. However, if there are several communities not more than 10 miles apart overall, it becomes possible to serve them from a single substation provided that the total demand is at least 5 megawatts, which is the equivalent of a community of about 50,000 persons.

2.4 Commercial Thresholds

The Pahang Tenggara Study examined data on commercial establishments for towns in Malaysia which indicated proportional changes in the ratio of commercial activities in relation to population.

A profile of retail, wholesale and catering establishments for a number of towns with a population of over 8,000 was analysed. The population of each of these towns was projected and the total population, the number of wholesale and retail establishments and their turnover was plotted (Fig. G.2B).

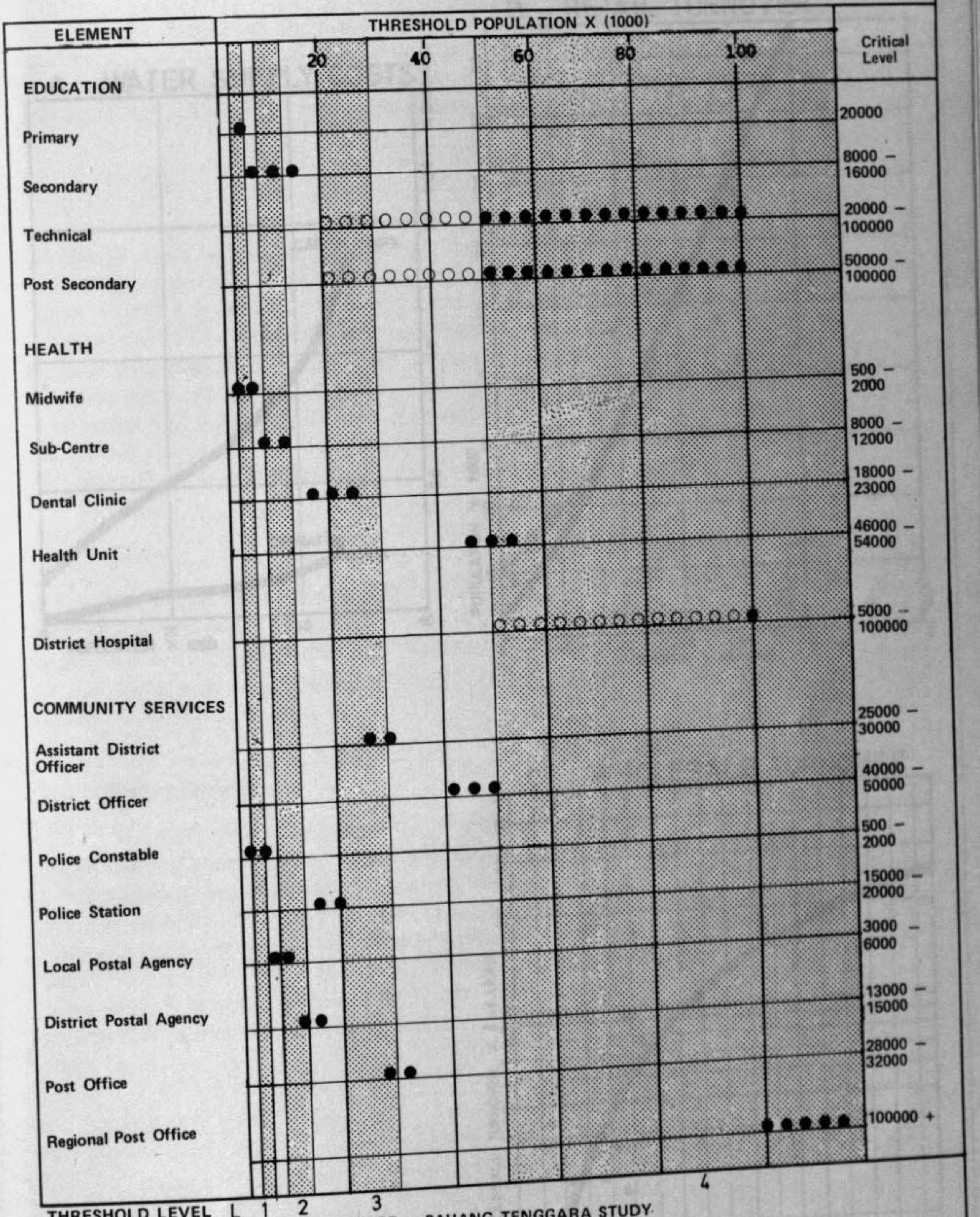
The analysis of retail establishments indicated two main points.

(a) From a population of 8,000 upwards the number of shops per capita varies only slightly, averaging 16 shops per 1,000 population. There is, however, a proportional relationship, with an increase in town population being paralleled by an increase in individual shop size.

(b) A break in the retail turnover graph occurs in towns with a population between 15,000 and 25,000. This has been interpreted as an indication of threshold and suggests that a relatively complete range of retail establishments is likely to occur when a town reaches a population of 15,000.

Because thresholds are related solely to urban population, changes in the density of regional population would probably tend to affect the commercial retail activity within the town. The lower curve for towns with a populations below 25,000 has been interpreted as an indication either of the existence of a small hinterland population or of communities which are relatively isolated.

The analysis indicated that the pattern for catering establishments is similar to that of retail establishments and therefore this has not been plotted on the graph. There appears, however, to be no similar pattern for wholesale establishments (Fig. G.2C) but locational characteristics seem to be the main criteria for volume of turnover. High wholesale turnover reflects a high retail turnover although wholesale turnover is not necessarily dependent on town size.



SOURCE: PAHANG TENGGARA STUDY

○ ○ ○ THRESHOLD IN ISOLATED AREAS
● ● ● CRITICAL LEVELS FOR SINGLE FACILITY

SOCIAL SERVICE THRESHOLDS
FIG. G.1

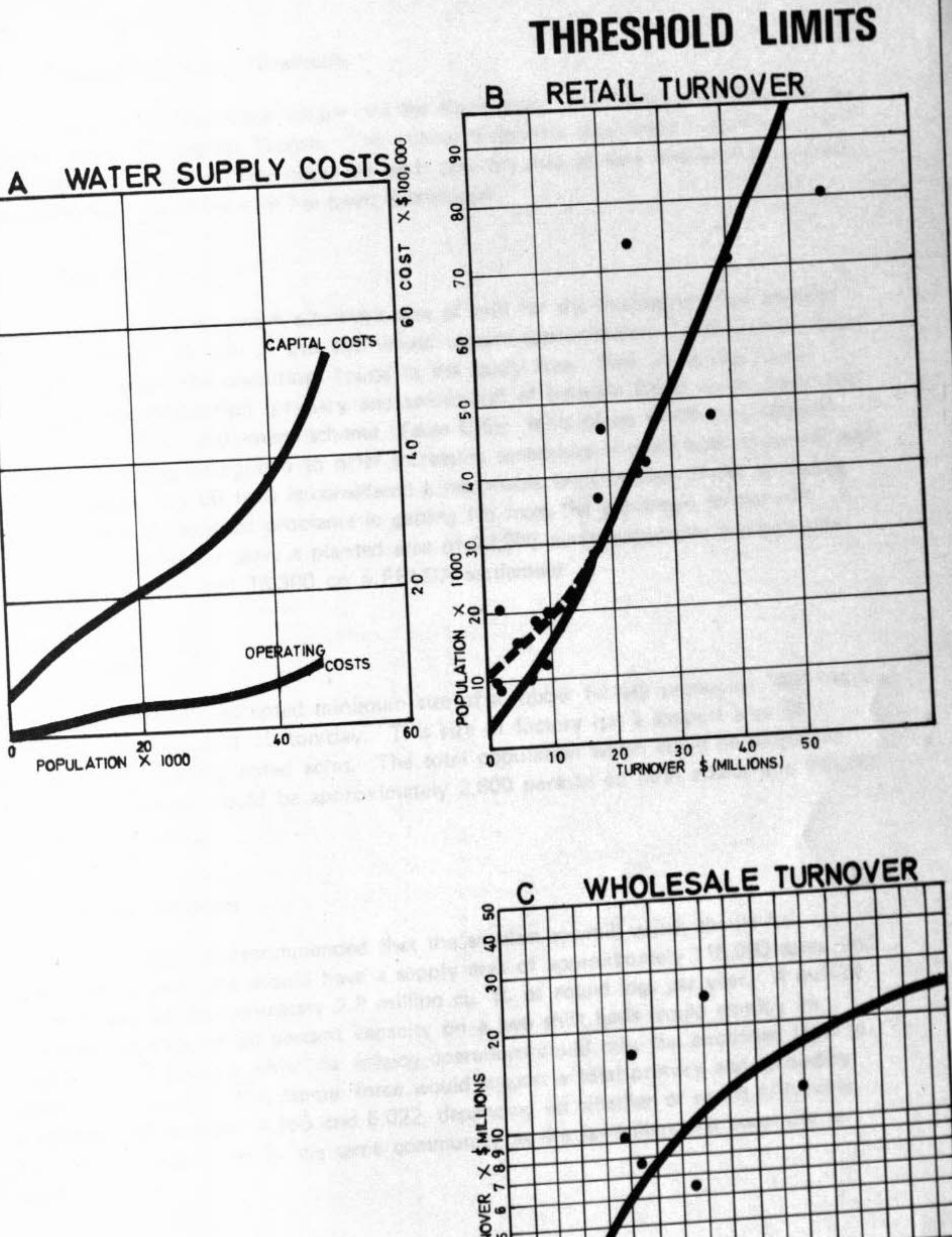


FIG. G.2

SOURCE: PAHANG TENGGARA STUDY

2.5 Primary Processing Thresholds

Forestry, oil palm and rubber are the three major areas where processing will be required within Trengganu Tengah. The critical thresholds established in each case refer to a single processing activity only. In each case the area of land and total population supporting that threshold size has been determined.

(a) Palm Oil

An accepted minimum economic size of mill for the processing of oil palm is 20 tons ffb/hour. A mill of this size would require approximately 7,400 planted acres to supply it under the conditions found in the study area. Such an acreage could support a total population (primary and secondary) of between 2,600 on an estate and 5,100 on a FELDA settlement scheme (Table G.5). Mills of up to 60 tons ffb/hour are now commonly recognised to offer increasing economies of scale both in capital and operating costs, but 60 tons is considered a reasonable limit in view of the increasing management and logistical problems in getting ffb from the plantation to the mill. A mill of this size would serve a planted area of 22,200 acres, supporting a population of 7,800 on estates and 15,300 on a FELDA settlement.

(b) Rubber

The generally accepted minimum size of a rubber factory producing SMR has a peak drying capacity of 10 ton/day. This size of factory has a support area of approximately 3,115 planted acres. The total population which could be supported by such an acreage would be approximately 2,600 persons on both estates and FELDA settlement schemes.

(c) Forest Products

The FAO has recommended that the smallest sawmill which should be considered in Malaysia should have a supply area of approximately 116,000 acres, and a throughput of approximately 2.8 million cu. ft. of round logs per year. A mill of this size operating at 90 percent capacity on a two shift basis would employ an estimated 540 persons while the logging operations could raise the employed total to about 660 persons. This labour force would suggest a total primary and secondary population of between 4,100 and 5,022, depending on whether or not it is feasible to have the loggers live in the same community as the sawmillers and commute to work.

Table G.5 Processing Thresholds and Support Populations

	Planted area (acres)	Direct workers	Indirect workers	Total jobs	Total families	Agricultural population	Secondary population	Total population
Oil Palm								
Settlement Scheme	7,400	740	60	800	556	3,080	2,053	5,133
Estate	7,400	496	60	556	348	1,582	1,060	2,642
Rubber								
Settlement Scheme	3,115	373	31	404	280	1,551	1,039	2,590
Estate	3,115	520	31	551	344	1,519	1,018	2,537

Forest Products	Acres	Total jobs	Primary population	Secondary population	Total population
Sawmill	116,000	541	2,462	4,110	6,572
Logging	116,000	120	546	912	1,458

This assumes an eventual primary/secondary ratio of 3:2. (See Chapter 11).

Source: Trengganu Tengah Study.

2.6 Manufacturing Activity

An analysis was made in the Pahang Tenggara Study, of data for 1968 as contained in the Census of Manufacturing Industries and other special information from the Department of Statistics. This analysis was carried out in order to determine the frequency of occurrence of manufacturing activities,their thresholds in terms of town support population and activity and employment profiles for communities of various populations. The main conclusions are in Table G.6.

In communities with a population of less than 15,000, the number of separate manufacturing activities is low. This number increases steadily with a rise in population. However, activity in major resource-based manufacturing is of great significance in small towns, accounting for 25 percent of total full time manufacturing employment in Peninsular Malaysia. It ranged between 50 percent and 75 percent of the total for towns with a population below 15,000, 30 percent to 40 percent in communities with 15,000 – 89,000 population and 12 percent with communities having more than 90,000 population. Primary activities such as sawmilling, though in a great many cases providing a basis for a town's existence, do not themselvs, stimulate the development of other manufacturing activity.

Activities related to local direct consumption such as bakeries, general food products, household furniture, tinsmithing, tyre retreading and radio repairs are widespread and many of them arecarried out in a traditional small scale way. They tend to be small operations employing few people directly but making use of family or part time labour. As communities grow these activities tend to increase in number rather than in size of the individual establishment. The activity profiles which resulted from the analysis demonstrate that towns of less than 15,000 population are dependent on resource-based processing and that in these towns manufacturing activities are very limited. In towns of over 15,000 people, resource processing remains important but manufacturing activity increases with population size.

A threshold for general industrial activity occurs in towns with between 30,000 and 50,000 population. This trend becomes even more noticeable in communities of 50,000 or more population. At this point it is worth mentioning that once a population of 50,000 is attained there appears to be very little difference in manufacturing activity profiles between Malay and non-Malay communities.

Table G.6 Manufacturing Activities, Resource-Based Employment and Total Full Time Employment Related to Town Sizes

Town Size	Average Number of Manufacturing Activities	Resource Base/ Total Manufacturing Activities (percent)	Average Number of Full Time Employees
Under 5,000	10	65	304
5,000 – 9,999	17	54	405
10,000 – 14,999	13	76	152
15,000 – 29,999	25	36	430
30,000 – 49,999	46	30	1,157
50,000 – 89,999	61	39	2,098
Over 90,000	98	12	10,430

Source: Pahang Tenggara Study.

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