Table 6.1 THE ROLE OF AGRICULTURE IN GDP, 1980-83
(M$ Million in 1970 Price)

	1980	1981	1982	1983
Agriculture Sector	6,255	6,516	6,995	7,030
Percent (%)	(23.9)	(23.2)	(23.6)	(22.4)
GDP at Purchaser's Value	26,228	28,092	29,677	31,396

Source: Mid-term Review of Fourth Malaysia Plan (March 1984)

The Malaysian agricultural production and hectarage for the period of Fourth Malaysia Plan are shown in Table 6.2 and Table 6.3. Among the major crops in the tables, oil palm and cocoa have shown a larger trend of increase in production and hectarage than other crops. Rubber, oil palm and paddy are the major crops of Malaysia, which comprise 81% of the agricultural area in hectarage in 1983.

Rubber remains to be the most important crop, covering more than 40% of the cultivated area, but its relative importance diminished in the 1970s caused by changes in demand in the world market and the government policy of crop diversification. Of the three crops, only the oil palm has significantly increased its production and acreage in the past 20 years. But, production and acreage of pepper and pineapple show a trend gradual reduction in these five years.

Table 6.2 MALAYSIA: AGRICULTURAL PRODUCTION[1], 1980-85
('000 tonnes)

	1980	1981	1982	1983	1984 (est.)	1985 (est.)
Rubber	1,530.0	1,525.5	1,517.0	1,530.0	1,550.0	1,570.0
Crude palm oil	2,575.9	2,824.5	3,511.1	3,015.0	3,473.0	3,938.0
Palm kernel oil	247.5	265.0	409.5	403.7	438.8	479.7
Pepper	31.7	28.8	25.2	23.5	25.0	28.0
Cocoa	32.9	48.0	62.0	65.0	72.3	81.0
Sawlogs[2]	27,915.0	30,653.0	32,824.0	34,231.0	32,862.0	31,548.0
Paddy	2,052.9	2,021.1	1,872.7	1,818.1	1,854.5	1,891.6
Pineapple	185.3	153.6	153.0	153.0	153.0	153.0
Fisheries	743.7	766.6	693.6	713.3	740.5	725.2
Livestock:						
Beef	13.0	12.1	13.7	14.0	14.4	14.8
Mutton	0.8	0.6	0.6	0.6	0.6	0.6
Poultry	114.3	115.3	115.9	121.7	127.8	134.2
Eggs[3]	2,296.3	2,307.6	2,379.5	2,498.5	2,623.4	2,754.6
Pork	122.6	130.8	126.7	130.5	134.5	138.5
Milk[4]	8,193.0	14,920.0	16,740.0	18,910.0	24,510.0	27,280.0

Notes : 1) Figures were obtained from relevant Government agencies.
2) Measured in thousand cubic metres.
3) Measured in million.
4) Measured in thousand litres.

Source: Mid-term Review

Table 6.3 MALAYSIA: CROPS BY HECTARAGE, 1980-85
(hectares)

	1980	1981	1982	1983	1984 (est.)	1985 (est.)
Rubber	2,010,000	2,006,488	1,966,400	1,990,000	2,000,000	2,012,000
Oil Palm	1,069,507	1,140,538	1,212,486	1,226,585	1,306,000	1,400,000
Pepper	12,720	13,405	12,800	11,362	11,007	10,800
Cocoa	108,556	150,030	190,000	205,000	211,000	237,000
Timber	383,000	391,197	486,950	585,907	560,000	560,000
Paddy	735,215	767,640	758,400	764,200	769,750	775,220
Pineapple	12,101	11,685	9,734	8,170	7,177	7,003
Tobacco	12,535	12,970	13,610	14,160	14,955	15,749
Vegetables	18,367	15,330	16,106	18,278	20,745	23,546
Orchards	93,000	87,800	89,000	90,000	92,000	94,000
Total	4,455,000	4,597,000	4,755,000	4,913,662	4,993,000	5,135,000

Source: Mid-term Review

1.2.2 Agriculture in the Terengganu State

As shown in Table 6.4, the share of agricultural sector in GRP of Terengganu is 30% in 1983, which is higher than the share of the same sector in GDP of Malaysia, 22.4% in 1983. Labour force engaged in this sector composes 52% of the total labour force, that implies the significance of agriculture activities in Terengganu.

The hectarages are shown in Table 6.5. Rubber and oil palm are predominant crops in the area, which share 38.8% and 29.6% of the total crop hectarage, respectively. The third predominant crop is paddy which shares 16.4% of the total crop hectarage. Percentages of these crop hectarages are almost same to that of Malaysia. Spatial distribution of the lands of main crops in Terengganu shows that oil palm and rubber are planted mainly in the inland area of Terengganu, paddy fields are cultivated in the northern plain area and coconut in the coastal area.

Table 6.4 AGRICULTURAL PRODUCTION IN GRP IN TERENGGANU, 1983

Unit: M$ Million, 1970 Price

	Crop	Livestock	Fishery	Forestry	Sub-total	State GRP
M$ (Million)	144.5	37.2	62.6	70.8	315.1	509.0
%	45.8	11.8	19.9	22.5	100.0	-

Source: EPU, Terengganu

Table 6.5 CROPS BY HECTARAGE IN TERENGGANU, 1981

Crop	Hectarage	Percent
Paddy	44,058	(16.4)
Rubber	104,231	(38.8)
Oil Palm	79,395	(29.6)
Coconut	10,318	(3.8)
Pineapple	732	(0.3)
Vg. & Food Crops	16,309	(6.1)
Cocoa	1,102	(0.4)
Coffee	195	(0.1)
Tobacco	2,419	(0.9)
Fruits	8,209	(3.1)
Miscellaneous	1,236	(0.5)
Total	268,284	(100.0)

Source: Annual Report D.O.A. Terengganu, 1981

1.2.3 Agriculture in the Study Area

(1) Production

The product of agricultural sector, including livestock, forestry and fishery, in the study area amounts to M$133.7 million (in 1970 prices), which is 26.3% of the GRP of the study area in 1983. The number of total employed people in the study area was 48,230 in 1983 according to this sub-regional study. Of whome 21,340 (44.2%) were engaged in agricultural activities.

It should be noted that the GRP of the study area includes the production of the off-shore oil, and if it is excluded from the GRP, the percent share of the agricultural sector becomes 54% approximately. The agricultural sector is the principal sector in the economy of the study area. The percent share of the sector is 30% in the State of Terengganu and 22.4% in Peninsula in 1983.

Agricultural production in this region comprises crops in 62.4%, forestry in 20.6%, fishery in 12.4% and livestock 4.6% in 1983. These are shown in Table 6.6.

Table 6.6 AGRICULTURAL PRODUCTION BY SUB-SECTOR, 1983

(1970 Prices)

	Crops	Livestock	Forestry	Fishery	Total
Price (M$ million)	83.4	6.1	27.5	16.6	133.7
Percent (%)	(62.4)	(4.6)	(20.6)	(12.4)	(100.0)

Source: From Chapter 1 Socio-Economic Framework, Technical Papaers-I

(2) Crop Production

Crop production in the study area is shown in Table 6.7. A characteristic of agricultural production in the study area is the cultivation of perennial crops, among which oil palm is the predominant product sharing 90% of the total crop production in the GRP of the area in 1983.

Table 6.7 CROP PRODUCTION IN THE STUDY AREA, 1983

(1970 Prices)

	Oil Palm	Rubber	Coconut	Padi	Other Crops	Total
Production (M$ million)	76.5	3.8	0.5	0.1	2.5	83.4
Percent (%)	(91.7)	(4.6)	(0.6)	(0.1)	(3.0)	(100.0)

Source: From Chapter 1 Socio-Economic Framework, Technical Papers-I

Oil palm, rubber and cocoa are mostly cultivated in the estate field. Farmers in traditional villages cultivate coconut, fruit, oil palm and rubber in small scales. They also produce vegetable, tobacco, watermelon, rice and others. Crop production in terms of GRP by farmers in traditional villages is small, about 5% in 1983 in the study area.

1.3 The Agricultural Subsectors

The planted area of principal crops by type of holding in KETENGAH for 1983 is shown in Table 6.8. The table shows that the total alienated areas for agriculture in the KETENGAH area was 118,000 ha, of which 53,000 ha (45.1%) was managed by governmental agencies and 16,000 ha (13.1%) by joint ventures. There are small holders who occupied 21,000 ha (17.5%) in the area.

Main crops planted and matured area are shown in Table 6.9. The figures increased at 20.4% per annum in 1980-83.

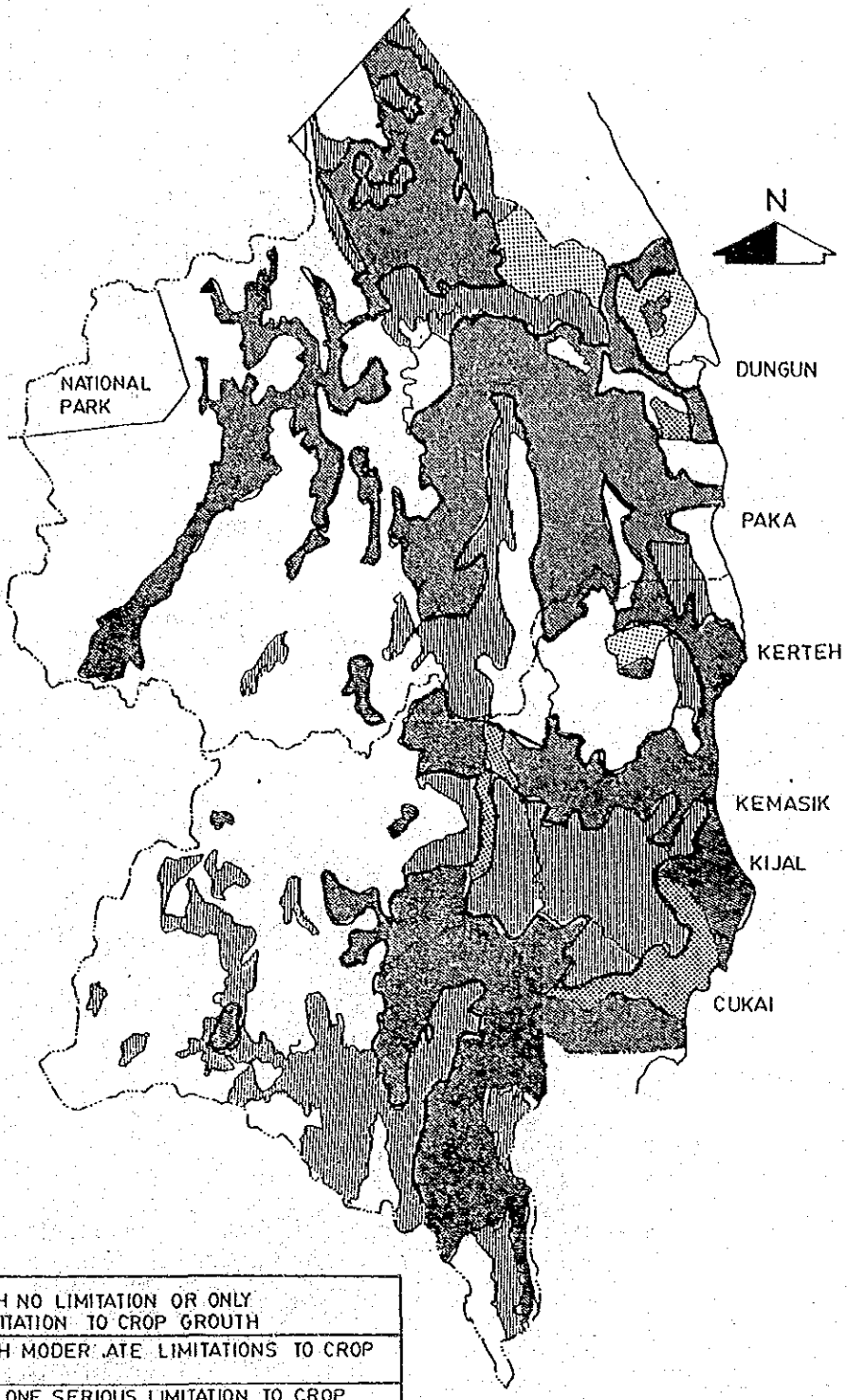
Table 6.8 PLANTED AREA (ALIENATED) OF THE PRINCIPAL CROPS BY TYPE OF HOLDING, KETENGAH, 1983

	Oil Palm	Rubber	Cocoa	Total[1)]
Public Sector[1/]	41,255 (49.8)	10,492 (34.9)	1,483 (45.2)	53,230 (45.1)
FELDA	28,928 (34.9)	3,031 (9.5)	-	31,959 (27.1)
SEDC	-	7,461 (23.4)	1,038 (31.6)	8,499 (7.2)
RISDA	8,998 (10.9)	-	-	8,998 (7.6)
FEICRA	2,520 (3.0)	-	-	2,520 (2.1)
PORIM	809 (1.0)	-	-	809 (0.7)
Others	-	-	445 (13.6)	445 (0.4)
Joint Venture[1/]	15,760 (19.0)	-	-	15,760 (13.3)
Private Sector[1/]	25,778 (31.2)	810 (2.5)	1,801 (54.8)	28,389 (24.1)
Smallholder[2/]	n.a.	20,647 (64.6)	n.a.	20,647 (17.5)
Total	82,793(100.0) (70.1)	31,949(100.0) (27.1)	3,284(100.0) (2.8)	118,026(100.0) (100)

Source: 1/ KETENGAH Authority, February 1984
2/ Laporan Tahunan RISDA 1978 and 1982

Note : 1) Including the areas for infrastructure and unplantable

Fig. 6.1 shows the soil classification and Fig. 6.2 shows the land use pattern in the study area. Criteria of soil classification are attached in Appendix.



LEGEND

CLASS .1
CLASS .2
CLASS .3
CLASS .4
CLASS .5

CLASS .1	SOILS WITH NO LIMITATION OR ONLY MINOR LIMITATION TO CROP GROUTH
CLASS .2	SOILS WITH MODER ATE LIMITATIONS TO CROP GROUTH
CLASS .3	SOILS WITH ONE SERIOUS LIMITATION TO CROP GROUTH
CLASS .4	SOILS WITH MORE THAN ONE SERIOUS LIMITATION TO CROP GROUTH
CLASS .5	SOILS WITH AT LEAST ONE VERY SERIOUS LIMITATION TO CROP GROUTH

More detailed legend is shown in Appendix Table 4.

FIG. 6.1 SOIL CLASSIFICATION

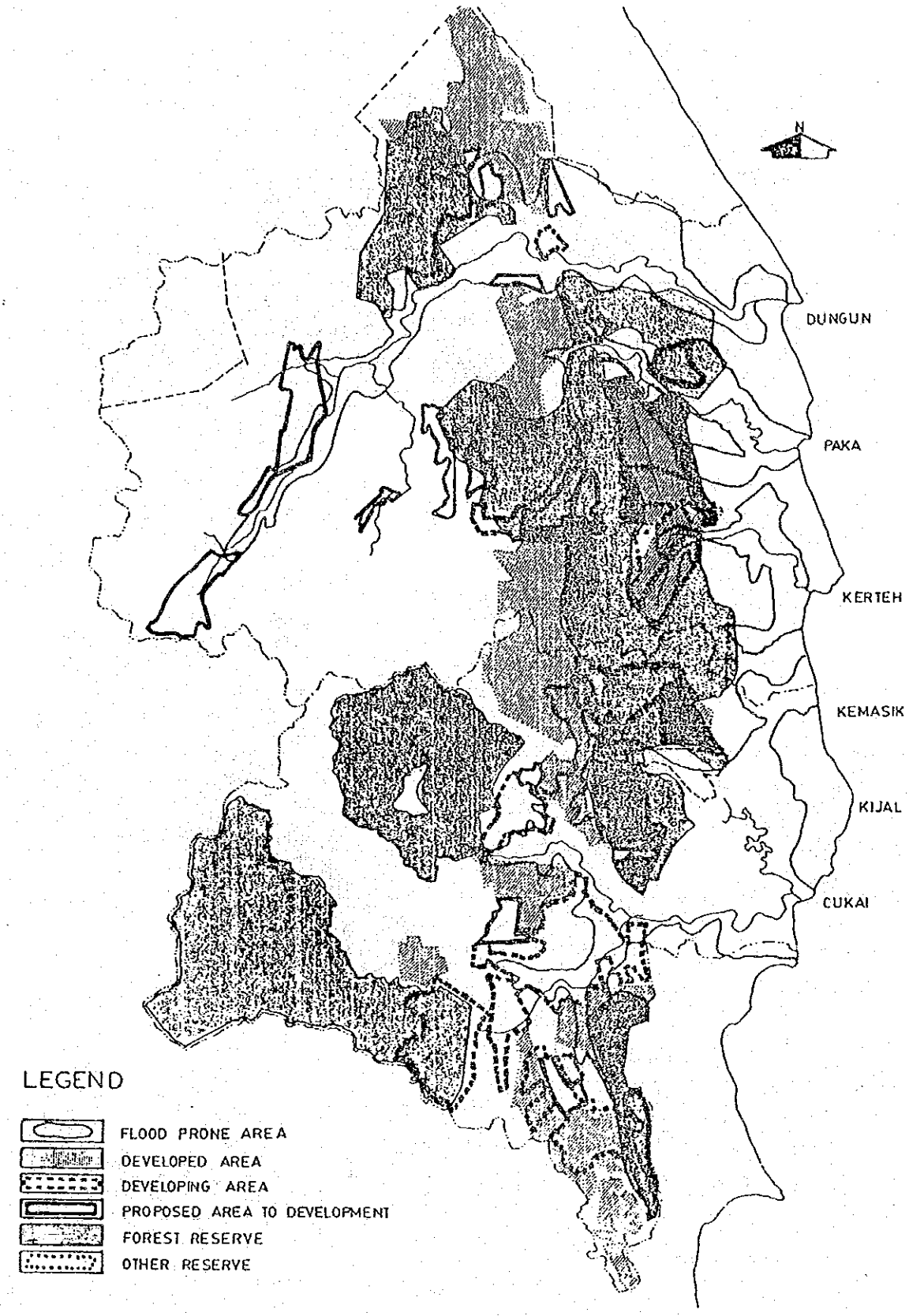


FIG. 6.2 PRESENT LANDUSE PATTERN

Table 6.9 MAIN CROPS PLANTED AND MATURED AREA, KETENGAH, 1980 AND 1983[1)]

	Ha in 1980[1/]				Ha in 1983[2/]				Annual increase in percentage 1980 - 1983			
	Oil Palm	Rubber	Cocoa	Total	Oil Palm	Rubber	Cocoa	Total	Oil Palm	Rubber	Cocoa	Total
a. Planted area	52,070	5,030	703	57,830	72,744	6,883	1,475	81,102	11.8	11.0	28.0	11.9
b. Matured area	29,210	2,080	450	31,740	49,878	4,833	664	55,375	19.5	32.4	13.8	20.4
b/a (%)	(56.1)	(41.4)	(64.0)	(54.9)	(68.6)	(70.2)	(45.0)	(68.3)				

Source: 1/ Laporan Kemajuan Suku Tahun Keempat, 1980
2/ Draft Laporan Kemajuan Suku Tahun (KETENGAH Authoriry, December 1983)

Notes : 1) Excluding the areas for infrastructure and unplantable.

1.3.1 Oil Palm

Oil palm is the most popular crop within the area, covering 82,793 hectares in 1983, which shared 70.1% of the alienated area in KETENGAH. Matured area was 68.6% of the actual oil palm planted area and increased 19.5% per annum between 1980 and 1983. Most of oil palm production within the area is undertaken by the estate system such as FELDA and other public agencies, private sector and joint venture schemes.

Jerangau is one of the most established fields. Annual yield in the well established estates in the area exceeds 22 ton/ha. But the average yield within the area is low at 10.6 ton/ha compared to the national average of 17.6 ton/ha. However, about 30% of oil palm trees within the area is still in premature condition. When maturity increases, the oil palm production will expand within the area.

1.3.2 Rubber

Rubber is cultivated mainly in inland areas but some planted areas disperse in the coastal area. However, rubber statistics related to the production, planted area and other conditions of smallholders in the coastal area are not available. Discussions are conducted mostly in the KETENGAH area where statistics are available.

Importance of the rubber in agricultural production has decreased whilst the oil palm area has increased its hectarage. However, rubber is still an important crop especially for smallholders in the study area. Rubber planted area is 31,949 hectare in the total of estates and smallholders, which shares 27.1% of the total planted area in KETENGAH. One of the characteristics of rubber production is found in the type of holding in the area; smallholders occupy more than 64.6% of the rubber planted area.

Rubber yields per ha in the study area was very low, especially in Dungun. Average rubber yield for estates with high yielding clone in Dungun was 482 kg/ha and in Kemaman was 1,276 kg/ha compared with the national average of 1,432 kg/ha in 1983 (Table 6.14). The same data indicate rubber yield in Terengganu declined between 1976 and 1983 and the average yields on estates decreased from 1,151 to 775 kg/ha in the same period.

1.3.3 Rice

Rice planted area and average yield in the study area are shown in Table 6.10. Rice is the main staple food in Malaysia and in the study area as well. Rice planted areas of Dungun and Kemaman in 1981 were only 1,620 and 330 hectares, respectively. It seems that paddy fields cannot expand because of shortage of suitable land and difficult topographic conditions in the area.

Table 6.10 RICE PLANTED AREA AND YIELD, 1981-82

	Planted area (ha)		Yield (kg/ha)	
	1981	1982	1981	1982
Dungun	1,620	388	1,591	1,273
Kemaman	330	-	1,870	-
Study Area	1,950	388	1,638	1,273

Source : LAPORAN TAHUNAN Terengganu, 1982

Remarks: Statistics of rice fluctuate so widely that it is hard to find a tendency.

The production volume within the area was about 3,200 tons in 1981, which was far in short of satisfying the regional demand. Rice yield of the area was 1,638 kg/ha in 1981 and 1,273 kg/ha in 1982, which are at 50% level in land productivity of the whole Malaysia (3,225 kg/ha).[1] Rice production within the area is mostly undertaken by smallholders. The subsector suffers from low yield and inefficiency in small unit of the field. A predominant proportion of output is utilised for self consumption.

Table 6.11 presents a percentage distribution of household holdings with rice by size in Terengganu. This table shows a serious problem besetting the rice subsector except low yielding in the small size of farmers. More than three quarters of the total rice farm holdings in Terengganu are less than 1.0 ha in size. According to the study team's survey, percentage distribution of household holdings with rice by size in the study area is supposed similar to the percentage distribution of Terengganu.

Table 6.11 PERCENTAGE DISTRIBUTION OF HOUSEHOLD HOLDINGS WITH RICE BY SIZE

Size Category (ha)	Terengganu (%)	Malaysia (%)
0.4	14.7	18.7
0.4 to 1.0	61.8	50.2
1.0 to 2.0	19.3	23.4
2.0 to 3.0	3.5	5.7
3.0	0.7	2.0
Total	100.0	100.0

Source: Census of Agriculture 1977, DOA

1) FAO Year Book, 1983

1.3.4 Cocoa

Cocoa statistics within the area is little available. As a result of encouragement by government policies in the 1970s, there was a rapid expansion of the cultivation of cocoa in Peninsular Malaysia. Cocoa planted area in KETENGAH is 3,284 ha, which shares about 3% of the main crop planted area (Table 6.8). Cocoa production within the area is undertaken by estate management. Cocoa is a promising crop for diversification within the area, because of its suitability for topographic natural condition and mixed cropping with main crops in the area such as coconut, rubber, etc. Therefore, cocoa will become one of the main crop in the area.

1.3.5 Coconut

Statistics of coconut planted area, production and yield in the area is not available. However, coconut is the important crop in the coastal area. Total planted area is considered about 1,500 ha in the study area. The distribution of coconut holdings by size in Terengganu and Malaysia is shown in Table 6.12.

Most of coconut is cultivated by smallholders on bris soils. Coconut is mostly produced by small size holdings less than 1.0 hectare. In Terengganu more than 90% of the coconut planted holding was less than 1.0 ha.

Table 6.12 PERCENTAGE DISTRIBUTION OF COCONUT HOUSEHOLD HOLDINGS BY SIZE, 1977

Size Category (ha)	Terengganu (%)	Malaysia (%)
0.4	51.2	38.4
0.4 to 1.0	40.9	36.5
1.0 to 2.0	6.4	15.2
2.0 to 4.0	1.3	7.5
4.0	0.2	2.4
Total	100.0	100.0

Source: Census of Agriculture 1977

1.3.6 Other Crops

There are not reliable statistical data about fruits and vegetables. MARDI in Rantau Abang and Sungai Bagin stations carry out research to diversify crops on bris soils. In the coastal area, cashewnuts, tobacco and watermelon cultivation are already common in agricultural fields. However, cashewnut cultivation under bris soil condition encounters a problem of the disease of the flower. Tobacco and watermelon production will increase if farmers can install water pumps and sprinkler system as well as fertiliser and insecticides.

In the inland area, there are two MARDI research stations, Jerangau and Kemaman, which carry out research about cocoa and fruits under hill and slope conditions. Most of farmers in the inland area cultivate fruits and vegetables around their houses. Production such as durian, rambutan, mango, banana, jack fruit, citrus, duku, watermelon and vegetables are mainly for self consumption and partly for local market.

SDOA carries out demonstration farms in the area with the following types of crop: cashewnut, vegetable, paddy, salak, maize, sericulture, durian, mango, banana, rambutan, watermelon, langsat, chili, guava, cocoa, chenpedak, coconut, sugarcane, duku, orange, and mangosteen.

These demonstration farms are an effective way to encourage a farmer's productivity and produce. Also the results of the demonstration supply information to promote diversification in the area. FELDA has recommended vegetable cultivation for the estate employees outside work duties in the estate. Oil palm estate occupies relatively fertile land in the study area. Therefore, vegetable production of estate employees will increase consumable vegetables. If the production of vegetables becomes a large scale, the produce can be marketed to the urban areas in the coastal area.

1.3.7 Livestock

Number of livestock in the study area is shown in Table 6.13. Livestock within the area is an important supply source of protein for small farmers as a side product of agriculture. All types of livestock are reared in small numbers. Water buffaloes have played important role as draft animal. Goat and sheep are kept mainly for home consumption.

Table 6.13 LIVESTOCK POPULATION, 1981-83

(Unit: Head)

	Dungun		Kemaman		Total	
	1981	1983	1981	1983	1981	1983
Buffalo	2,219	2,633	1,866	550	4,085	3,183
Cattle	3,416	4,904	5,935	5,443	9,351	10,347
Goat	1,585	3,145	2,368	2,161	3,953	5,306
Sheep	281	846	167	63	448	909
Poultry	N.A.	71,809	N.A.	15,109	N.A.	86,918
Total	7,501	83,337	10,336	23,326	17,737	106,663

Source: State Veterinary Dept. Terengganu

1.4 Supporting Systems

1.4.1 Research

An Agricultural Research Institutes of MARDI are administered by the Ministry of Agriculture. Subjects of the research, budget allocation, staffing, etc. are determined in the MARDI head office of Serdang. In the study area, there are two stations for cocoa and fruit trees at Jerangau and Kemaman. In addition, a research unit for tobacco is in Rantau Abang, where a research officer is posted. A research station of oil palm (PORIM) was established at Ulu Paka in late 1984 being moved from the compound of MARDI Jerangau.

RRI, PORIM and other agencies do service to related communities such as FELDA and RISDA. MARDI, RRI and PORIM conduct advisory service jointly if it is necessary. The content of the service is said expanding both in problems of quantity and quality, associated with estate and traditional village development. In addition, a close cooperation between research stations and administrative agencies should be intensified in order to get new information and transfer technology.

1.4.2 Extension Service and Management Systems

The extension agencies are organized by ministries and agencies, each covering specific subject and crop as follows:

(1) SDOA

The organisation of the SDOA covering the study area is responsible to provide farm level extension activities. There are two district agricultural offices (Dungun and Kemaman) and four extension offices (Dungun, Jerangau, Cukai and Kemasik) in the study area. The grass-root extension service is made by each extension worker in these offices in accordance with the T and V system.

(2) FELDA

Authorised in 1956 by the Federal Government, it has engaged in land development all over the country. In KETENGAH it played a major role not only in land reclamation but in the management of estate farming and of factories of palm oil. Its policy is to give a block of fields in production for some 20 families, letting them in a cooperative system. Each settler has a share of 4 ha in the common ownership of the block. The cost is scheduled to be refunded by them in 15 years after the settlement.

(3) FELCRA

Land development in the fringe of smallholders' villages and in-situ restructuring are the major role. For new rehabilitation, selection is limited to youths, not to families as FELDA. Good example of its contribution is seen in the oil palm farming around Bandar Seri Bandi.

(4) RISDA

Replanting of total rubber farms by smallholders and upgrading of quantitative and qualitative rubber products are the major role. Purchase of unsmoked sheet (USS) is also carried out. An oil palm farm of 9,000 ha is developed by ESPEK, its subsidiary function in the KETENGAH area.

1.4.3 Other Agencies

(1) SEDC

Among various economic activities, farm managements of oil palm, rubber and cocoa estates, and timber complex are major participations of SEDC in the KETENGAH region. They include the construction of factories and mills, mostly in joint venture with other bodies.

(2) KETENGAH

Major roles are to coordinate various development schemes by the above federal and state bodies, and to develop infrastructure of the region such as new townships and their social amenities.

2. Problems and Recommendations

2.1 Low Productivity

2.1.1 Low Productivity and Poverty

The agricultural sector in Malaysia is characterised by the presence of an efficient and well-organised estate sub-sector as well as non-organised small-farm sub-sector. Currently, particularly the small-farm sub-sector is faced with several constraints, some of which are structural in nature. These include the existence of uneconomic-sized holdings, low-return yields, traditional methods of production and cropping patterns and inadequate access to assistance and support services.

The interplay of these constraints has resulted in the low level of productivity and household income in the small-farm sub-sector as compared to the estate sub-sector. This low level of productivity and income has led to the incidence of poverty in this sector when compared with other economic sectors. To overcome poverty and income differential in agricultural sector is one of the main objectives of National Agricultural Policy (NAP).

Characteristics of the agricultural sector in the State's economy are no exception. Rather the sector is situated in more difficult conditions. These characteristics of the state were studied and policies for improvement were recommended in the Terengganu Master Plan Study, 1983 (TMPS). The recommendations in TMPS follows the emphasized actions in NAP.

Agriculture in the study area has also two sub-sectors: estate farming and traditional villages. The estate has been developed to cover most of the designated and suitable lands. Production will increase in accordance with the progress of tree maturity. The concerned agencies prepare plans and programmes to harvest the increasing products, although there are difficult problems to be solved. Average crop yields of main crops are shown in Table 6.14 for the comparison of the study area, State and Malaysia in 1983.

In traditional villages, the production was rather self-sufficient in a closed community. Production was small and productivity was low. However, their gradual involvement in the modern national economy becomes a due course in the development. When they are viewed from the development objectives and strategies, low productivity and the resultant low income become the priority subject to be improved.

Main causes of low productivity of the agriculture in the area are classified as follows:

- Severe weather conditions and topography
- Low soil fertility
- Less developed technique
- Small farm size, etc.

Of these causes, low soil fertility and less developed technique would be possible to be improved by applying appropriate material and technique. In this context, the "study on research and development" was taken up as a subject in the Phase III Study. The result of this study is edited in Volume 3 Study for Agriculture Reseach and Development.

Table 6.14 AVERAGE CROP YIELD OF MAIN CROPS, 1983

Unit: kg/ha

	Oil Palm[1/]	Rubber[3/]	Rice[4/]
Malaysia	17.6	1,432	3,225[5/]
Terengganu	12.7	775	1,975
Dungun	10.6[2/]	482	1,591
Kemaman		1,276	1,870

Source: 1/ Oil Palm, Coconut, Tea and Cocoa Statistics 1981
2/ Ketengah's Quarterly Report (1983-December)
3/ Rubber Statistics Handbook Malaysia, 1981
4/ Annual Report 1981, Dept. of Agriculture, Terengganu
5/ FAO Year Book, 1983

2.1.2 Crop Diversification

When new agricultural lands are alienated, it is desirable to keep some plots for fruits or vegetables. TMPS mentioned the necessity of increases in these production and suggested the creation of designated places for specialised products; for instance, Bukit Payong (outside the study area) for vegetables, and Jerangau and Jabor for fruits. Even when existing traditional farms or dusuns are improved and converted for this purpose, new land would be required to meet the demand from the developing urban areas of the coastal area.

It is recommended that a few lots where the soil condition is suitable should be selected from the new alienated areas and used for growing fruits and vegetbles. Suggested lots are in zone 7, 12, 13A according to the KETENGAH map. A conceptual study of 'duku langsat' by KETENGAH in 1982 suggested zone 7 and 12 also.

Part of the settlers should be organized into the integrated growing project. It can be named as an orchard scheme, which would be supported by extension and other services by Government agencies. Substantial support is necessary because their farming would be more or less experimental at the initial stage. In the orchard scheme, short term crops like banana or pineapple could be inter-cropped to obtain supplemental incomes. Marketing system should be provided or supported by the development agencies.

2.1.3 Cropping Pattern

Unlike the Ketara region, rice area is scattered in riverine areas with quite limited hectarage of 1,950 ha which represents only 5.4% of the state total of 35,900 ha in the main season of 1981. Often rice fields are abandoned in the dry season. Upland food crops such as maize, groundnut and beans are grown in small scale for domestic consumption. Some vegetables and watermelon are cultivated for marketing purposes in a limited quantity.

Accordingly as far as the total hectarage is concerned, dusuns (mixed fruits and coconut farm yards around villager's houses) are estimated to rank next to the rubber planted area, but statistics by districts are not available. It is a typical way of life that daily, seasonal or occasional cash income from rubber, dusun or free grazing livestocks are realised to cover the shortage of rice, staple food, and others.

2.1.4 Subjects for the Research

It is recommended the following subjects should be included in the research works.

(1) Diseases

a) Cashewnut

Approximately three quarters of the area of 15,000 ha planted with cashewnut trees in Peninsula are located on the bris soil area of the east coast. Farm lots were cultivated and a processing plant was once constructed at Besut by CIMA. But the plant was closed in 1982 after the operation of four years.

Main reason of the plant closure was the reduced yield from the cropping field caused by the disease of the flower (inflorescence). It is damaged by colletotrichum and pestalotia. An effective countermeasure should be found.

b) Cocoa

In Sava state, damages by acrocercops sp (an insect) require an urgent remedial measure. It is said the insect uses rambutan as the host tree.

Both cocoa and rambutan are major products to be encouraged for growing in the study area. The disease and insect should be investigated and a protective measure should be found.

c) Clove

The clove is planted in Sumatra of Indonesia not only in the coastal area but also in the inland area. It is an income raising crop in that region. It is said it is seen or Perhentian islands off the coast of Besut. It can find market rather in other countries where the main demand is found in the tobacco industry. The adaptability should be studied.

d) Seedless Bread Fruit (Artocarpus Incisalium)

It is a kind of fruit named Sukun or Sukin in Malaysia. It belongs in the same genus of Nangka and Chenpedak. In Jamaica of Carribean Sea, it is served not only in peoples' homes, but in restaurants and hotels. In that country it is shown as an example of good success in introducing a new type. The adaptability should be studied.

e) Spondias Lutea Liun

In Malaysia, coconut trees are often used as the shading trees of cocoa field. When other suitable trees for shading are looked for, this should be studied. In Bahia state, Brazil, this spondias lutea liun is used commonly. This will yield fruits and the years to mature is relatively short (4 years). A study is recommended.

f) Vegetables

In order to increase the kinds of vegetable crops produced in the area, trials should be conducted. The followings are examples to be incorporated in trials, including quality improvement.

- Watermelon, sweetcorn, rockmelon, etc.
- Cabbage, tomato and onion
- Root crops such as short term carrot and radish
- Pepper, pumpkin, winged bean
- Potato, chinese cabbage, cauliflower (inland high latitude area)
- Specific variety for the tobacco field.

The bris soils can effectively discharge organic compound and nitrogenous fertiliser. In addition, sprinkler/dripping tube installed already for tobacco can be utilised. Vegetable cultivation in the tobacco field during fallowing season is worthy for research.

g) Fruits

Quality improvement is necessary in order to be competitive with the produce in other regions in the market. For example, if rambutan with the ease of aril separation is produced, it will secure the demand in urban markets and canning industry. Plasan, richee, kola, etc. for higher land area should be intensified in the research trials.

h) Utilization of squeezed oil palm cake

Possibility to use the squeezed oil palm cake for livestock feed, fertiliser and others should be studied. Specifically adaptability for the feeding of Kedah-Kelantan cattles is found suitable in the northern Terengganu. If practicable, it can be a product of the agro-based industry in the KETENGAH area.

Currently, staff in DOA work in the field to extend technical service in traditional villages. If the systematic production to supply into enlarged urban market is to be encouraged, specialists capable in covering a variety of specific subject matters will be indispensable, particularly because vegetable or fruit diversification is foreseen. Education and training organisation in Terengganu should take part in training subject matter specialists in agriculture.

2.1.5 Other Supporting Services

(1) Develop the feeder roads with surfacing and appropriate slope protection and drainage. The road network will enhance the efficiency of transportation of material and fresh fruits. The slope protection and drainage will sustain the effective functioning of feeder road network and keep the fertile surface soil from erosion.

(2) Use of smaller tractors/vehicles to carry the fruit bunches, fertilisers, etc. between the narrow feeder road and the main road system. In addition, mono-rail transport system, cable way, etc. should be studied. Also, increase the use of mechanical equipment in farm operation. These mechanical aids will contribute in raising productivity. The possibility of a robot-like machine in cutting leaves and fruits should be researched.

2.2 Traditional Villages

2.2.1 Smallholders' Rubber

There exist roughly 33,000 ha of smallholders' farms in the study area, among which areas more than 20,000 ha are covered by rubber, according to the annual reports of RISDA as shown in the following Table 6.15.

Table 6.15 AREAS OF SMALLHOLDERS' RUBBER - 1978 AND 1982

	1978			1982		
	Lots	ha	ha in coastal	Lots	ha	ha in coastal [1)]
Dungun	2,100	4,755	1,928	3,223	7,039	2,332
Kemaman	3,867	9,867	4,534	5,764	13,608	6,127
Total	5,967	14,622	6,462	8,987	20,647	8,459
Percent		(100%)	(44%)		(100%)	(41%)

Source: Laporan Tahunan RISDA 1978 and 1982

Notes : 1) These ha are calculated by the study team by classifying the data by mukim.

It is found that rubber planted by smallholders covered 8,500 ha in the coastal area. The figures of smallholders seem to include not only the net area but also the mixed planting areas with fruit trees and others. The increase in 1982 from 1978 would indicate the new registration which were managed for many years without registration.

Another source of figures by Districts are given in the Rubber Statistics Handbook as shown in the following table.

Table 6.16 AREAS AND PRODUCTION OF RUBBER, 1981

		Terengganu	Dungun	Kemaman	Total
Planted area (ha)	Estate	9,599	5,144	2,084	7,228
	SH[1)]	N.A.	N.A.	N.A.	N.A.
Production (tons)	Estate	3,786	968	1,690	2,658
	SH	17,466	940	1,930	2,870
	Total	21,252	1,908	3,620	5,528
Yield (kg/ha)	Estate	394	188	811	368
	SH	N.A.	N.A.	N.A.	N.A.

Source: Rubber Statistic's Handbook Malaysia (Dept. of Statistics, 1981)
Notes : 1) SH means smallholders

These two tables are not consistent. In Table 6.16 production figures in Dungun are abnormally small. It could be summarised that smallholders produced 82% of the total production in the state, while their share was approximately half in the study area. Due to the labour shortage and unfavorable rubber prices in the market, daily tapping works in small holdings are limited to a small portion of the holdings.

RISDA plans to complete re-planting of the whole area within a few years with subsidies and loans to cover the cost of livelihood for the period of the prematurity 5.5 years. Up to 1982, RISDA had replanted the area of 2,330 ha in Dungun and 6,130 ha in Kemaman.

As for the production potential of smallholders' rubber, an estimation was tried in Table 6.17. Area covered by trees over 6 years old is considered as in production.

Table 6.17 FORECAST RUBBER PRODUCTION BY SMALL FARMERS

Year	Area in production		Production		Yield
1983	6,300 ha	100%	1,600 t	100%	250 kg/ha
1990	9,500 ha	151%	1,880 t	194%	200 kg/ha
2000	14,500 ha	230%	2,280 t	219%	160 kg/ha

Source: Study Team

In the above estimate, rubber production by smallholders are placed quite lower than the estate production, because of mixed planting and halt in the tapping.

2.2.2 Demonstration Farm

A demonstrative farm lot should be developed for the cultivation of fruits and vegetables which can be developed into integrated vegetable growing projects, and other crops such as watermelon, maize, etc. The lots should organised to demonstrate an efficient way of cultivation including the use of conventional water pumps, sprinklers, motorised cultivator, etc. Demonstration, together with persuasion and encouragement, will motivate a traditional farmer to engage in expanding his cultivation lots by renting or buying unused and abandoned fields. Currently, these movements are quite seldom.

2.2.3 Market System

A market system should be organised under which producers can sell their harvest periodically.

- Farmer's association should be extended in which majority of producers of traditional villages participate in marketing perishables. The association will administer volumes, destination, timing, and price negotiation on behalf of the participants.

- A wholesale market system should be organised in which purchase and sale prices are determined under bidding or open negotiation. Retail shops should register under this system to buy the perishables.

The association and the wholesale market will be able to control unfavorable behaviour of middlemen and transport operators who often exploit the individual producers by imposing high charges for the service. FAMA and other Government agencies should initiate the development of this system at the beginning stage. However, once the system is organised and the functions begin to work, not the administered market but the free market mechanism should play a key role.

Currently, shipment to the urban market is irregular and village farmers in the area upstream of rivers are charged with high cost for hiring boats for the transport of produce. These elements result in low net income to the traditional farmers, discouraging the market oriented production.

Road network should be constructed into these areas, with which they can have easy access to the market. If the road cannot extend to the villages upstream of the river immediately, the cost of using boat transport should be alleviated by provisionally subsidising part of the cost.

2.3 Land Settlement Schemes

2.3.1 Labour Requirement in Land Schemes

The land scheme development indicates that 92% of the current plantable area of 87,600 ha are already planted. The remaining 8% area will be planted in a few years. In addition there will be new alienated land of 25,400 ha which will be developed hopefully within several years.

It is a basic understanding that KETENGAH has shown a substantial achievement in its development effort in the past ten years, although there are some delays in part of the programmes. In the current farm operations, some shortage in work force are apparent in the estates except the FELDA system.

It is commonly recognised that immigration into the FELDA scheme has drawn much more applicants than the other estate work places. It is a cooperative work system based on co-ownership of the developed land, while the other estates employ labour under a 'wage payment system'.

When the trees mature and produce much yield in the future, the demand for additional 7,000 labourers should be filled in. An estimate in this study indicates KETENGAH will require the additional workers of this amount in 2000. It is felt that difficulty will increase in the future in recruiting this amount of additional labourers.

The estate production system requires additional 7,000 workers in 2000 compared to the employment of 11,500 in 1983 under the current plan of alienation in the KETENGAH area. The estimate is shown below:

- If the matured trees of oil palm 88,000 ha (Table 6.22) produce the oil palm fruits, the labour requirement is calculated as:

$$88{,}000^{ha} \div 4^{h/prs} = 22{,}000^{prs}$$

  where 4 persons/ha comes from the general criteria of FELDA system in allocating the area to settlers: currently 4 ha is assigned to one worker for oil palm field.

- In 1983 there were 11,500 workers engaged in the estate production system as shwon in Table 6.18. Accordingly, the balance 22,000 - 11,500 = 10,500 is considered necessary to fill in the requirement.

- In rubber and cocoa field average labour requirement is higher than the oil palm field. In KETENGAH area, oil palm field is forecast to share the majority (88%) in 2000.

  Additional labours per ha in cocoa and rubber tree fields are considered marginal in this kind of forecast.

- Participation of family workers will fill in part of the labour shortage. Increases in labour productivity will also reduce the labour requirement. By considering the work conditions in the estate area, these factors are assumed 20% respectively in this study. Accordingly, the following figures are determined.

  10,500 x (0.8 x 0.8) = 7,000 ..... Additional necessary labour from 1983 to 2000

  Additional labourers of 7,000 compared to those in 1983 are necessary to sustain the estate production system of the KETENGAH area in 2000.

The country as well as the coastal area move forward further into industrial development. In that case the industrialisation will generate more work opportunities which are filled by labour force often from the agriculture sector, competing with the labour demand of the agriculture area. The situation, in which KETENGAH system is involved, is no exception. It has to compete with industries and urbanisation in keeping the work force for the estate production system.

From this viewpoint the following recommendations are presented with regard to the estate production system in KETENGAH.

2.3.2 Encourage the Immigration of Workers

Open the doors to settlement and job opportunities not only to Terengganu inhabitants but also to those in other states of Kelantan, Pahang, etc. Priority in settlement was given to applicants from Terengganu State. However, in the future applicants from Terengganu will be less than those required by the estate system. The shortages should be filled in by inviting immigrants from outside of Terengganu.

Currently, there are already some foreign contract workers coming from Indonesia and Thailand. They have been incorporated in the estate production system. Since there are little social problems with their involvement, it is likely that foreign workers will continue to work in the future under the appropriate immigration rules, increasing the number in some cases. In order to sustain the increases in agriculture output, employment of foreign workers should be given due consideration.

2.3.3 Ownership Participation

The FELDA type co-ownership and co-operative work system has more advantages in finding and settling in the workers in the developed land than the other wage-payment system. It is recommended that the FELDA type system should be applied to the new alienated areas.

For the other estate systems in the KETENGAH area, a possibility of changing them to the FELDA type system should be studied. Certainly, complicated procedures in legislative and administrative bodies are prerequisite to change the other estates into the FELDA type estate. The change may take a long time, however, it is an important measure to maintain the KETENGAH system.

It is noted by those in KETENGAH and FELDA that, however, there are some problems to be solved in the block administration of FELDA in such matter as the equality principle in income distribution among the block participants whose work performance are different. Also, it is noted that when the co-ownership of a participant is inherited by his children and/or relatives, there rises a problem if the co-ownership share is divided amongst them. This point should be cleared by law as well as by the farm operational viewpoint. These problems should be studied and solved in order to sustain the FELDA system.

2.3.4 Allowances for Private Cultivation and Incentive Payment

Under the current estate system there are no space for the workers, except for the small lot surrounding the residential unit, to raise the fruit trees and/or vegetables privately. It is recommended some allocation of free private cultivation lot should be given to the workers somewhere in the estate when the new land is alienated or by re-arranging the developed area. A small allowance for private cultivation for their own consumption may give variety in the ways of life in the estate community.

Some of these plots could be utilised for adaptation trials of new crops. If the location and crops are found suitable, the plots can be used as seed farms of some special crops. The determination of the location of these lots should take into consideration the possibility of using part of the area claimed for the orchard scheme.

Apply incentive payment schemes. The incentive payment schemes encourage estate workers and smallholders to raise productivity by improving their farm operation. Persons in KETENGAH and other agencies suggest to adopt these schemes by referring to a case in sugarcane and banana harvesting. However, no actual programmes are studied in detail. The schemes should be studied particularly in finding the manageable allowance to be allocated for the incentive in relation to the cost and sale price of the product.

2.3.5 Swamp Areas

A master plan study for the swamp area development in South Terengganu was conducted by JICA in 1980. It recommends the reclamation and cultivation of rice and other crops on selected swamps by proposing new settlements.

After the study no action has been taken by the State, probably with the following reasons.

- It is apparent that to introduce new settlers on the reclaimed swamp areas for the cultivation is not practicable when it is observed that farmers move into urban areas thus abandoning the cultivation of rice fields. No one could assure the viability of finding new settlers when the rice fields are left without cultivation in adjacent areas.

- The cost to protect the reclaimed areas from the flood would be more expensive than the study's estimate. This point was confirmed again by identifying the large flood in late 1983.

- The swamps are often covered by the reserved forest area. No development work would be authorized unless the benefit is socially, economically and ecologically identified. For example, the reclamation of Bukit Bauk swamp was proposed. It is surrounded by the reserved forest and the special Kapur protective forest is located adjacently.

- Industrial development in the coastal area started after the study. The current situation is quite different from the time when the study was conducted.

2.4 Population and Employment

Statistical data of employment and population shown by various sources were studied. They were not consistent with each other, causing difficulty in finding tendency of changes. According to the updated information of KETENGAH Authority, it is understood that the figures in Table 6.18 indicates the existing status.

There are 26,600 people in the new townships, while there are 11,700 people in the other estate communities. In addition the estates employ the traditional villagers of approximately 2,900. Accordingly the livelihood of their families, in the total of 13,000 people, depends on the estate production system.

Table 6.18 EMPLOYMENT AND POPULATION IN KETENGAH REGION (SEPT. 1983)

		Employment			Population[1]
		BU	NB	Total	Total
Townships	A	2,832	165	2,997	26,551
	B	1,707	153	1,806	
Estates	A	5,166	2,486	7,652	11,735
	B	4,495	2,388	6,883	
Nearby	A	2,641	282	2,923	21,179[1]
Villages	B	2,508	274	2,782	
Total	A	10,639	2,933	13,572	59,465
	B	8,710	2,815	11,525	
B/A (%)		81.9	96.0	84.9	

Source : Laporan Kemajuan Suku Tahun (KETENGAH Authority, September 1983)

Remarks: BU - Bumiputeras
NB - Non-Bumiputeras
A - Total
B - Agricultural Sector

Notes : 1) About 8,000 of traditional people, who are living in riverine areas mainly, are included.

Table 6.19 AREAS IN PRODUCTION, 1980

	Oil Palm	Rubber	Cocoa	Total
a. Area planted (ha)[1]	52,070	5,030	703	57,830
b. Area in production	29,210	2,080	450	31,740
c. b/a (%)	(56%)	(41%)	(62%)	(55%)
d. Percent of b in total	(92%)	(7%)	(1%)	(100%)

Souce: 1) Laporan Kemajuan Suku Tahun Keempat, 1980

In the above Table 6.18 those working in the estate systems are 11,500 in total. Although their work systems are different between the FELDA type estates and other wage employment estates, there would be no substantial difference in work performance. In the FELDA system, an averaged 4 ha per settler is the basic block of cooperative production.

By using the same figure and the area in production of 49,900 ha (Table 6.9), the required workers are estimated as follows:

Oil palm estates	49,000 ÷ 4 = 12,500
Rubber and cocoa	5,500 ÷ 4 = 1,400
Total	13,900

Accordingly, 13,900 - 11,500 = 2,400 jobs are supposed to be vacant somewhere among the 47 project lots in the KETENGAH region. Most of this shortage is covered by part time work of the settlers' wives and children and of those living in traditional villages, etc.

It should be noted that the shortages will be severe in the coming years because the area in production increases as the trees grow up into productive ages, which was discussed in the previous subsection, 2.3.1. Population and employment forecasts of the study area are presented in Chapter 1 Socio-economic Framework of Technical Papers I.

3. Development Potential

3.1 Land Availability

The KETENGAH area is mainly classified into forest areas and the agricultural areas. The forest areas are again delineated into the reserved and the yield concession forest. Accordingly, the area left for cultivation is determined so far as the main classification of the total KETENGAH area remain as it is. In the past ten years the area development has been conducted by various agencies upto the status shown in previous Table 6.8.

According to the development plan of KETENGAH, it awaits authorisation of the alienation of 25,400 ha including the area of 2,925 ha which will be alienated again. No action for the alienation is taken by the State by August 1984 of the above planned alienated area. The area of 11,990 is located in the sub-districts of Jengai and Pasir Raja on both sides of the Dungun River while others are scattered in the region.

A master plan for the reclamation of this land is prepared by Projekon Company in 'Feasibility Study for the Development of Mukim Pasir Raja and Jengai, 1984'. It suggests only 3,510 ha could be used for oil palm and fruit trees and remaining 8,480 ha should be converted for planted forest due to topographic difficulty. If this recommendation is adopted, the total new agricultural land is estimated at roughly 17,000 ha (25,400 - 8,400 = 17,000). Though this land is not alienated yet, some preparatory works such as construction of access roads and partial logging has started already.

The production increase is estimated firstly for the existing estates and secondly for the new reclaimed land.

3.2 The Existing Estates

As shown below, the net total plantable area is 77,000 ha for oil palm, 7,670 ha for rubber and 2,870 ha for cocoa. They are assumed to become productive in the year 2000 at the latest. The net total planted areas of 1983, which are shown in Table 6.9, are assumed to be in production before 1990.

Table 6.20 ALLOCATED AND NET PLANTABLE AREAS IN ESTATES, 1983

(Unit: ha)

	Oil Palm	Rubber	Cocoa	Total
Allocated 1/	82,800	11,300	3,300	97,400
Net Plantable 2/	77,000	7,670	2,870	87,540

Notes: 1/ From Table 6.8
2/ From the same source of Table 6.8

Average yield per hectare is assumed to increase because of tree maturity and increased productivity. The following Table 6.21 presents the forecast production in 1983, 1990 and 2000.

The average yield of 18 tons/ha is determined by referring to 'Oil Palm, Coconut, Tea and Cocoa Statistics of 1981'. It shows the range of the average yield in 11 states is from 12.7 (Terengganu) to 21.5 (Selangor) with the overall average at 17.8 tons/ha. In KETENGAH there are some estates having the average yield of more than 20 tons/ha in 1983, according to its Fourth Quarter Report of 1983.

Table 6.21 FORECAST AREA AND PRODUCTION: THE EXISTING ESTATES

		Net Area in Production	Production	Yield
Oil palm	1983	49,880 ha	529,200 mt (FFB)	10.6 mt/ha
	1990	72,700	1,163,200	16.0
	2000	77,000	1,386,000	18.0
Rubber[1)]	1983	4,830 ha	3,790 mt (DRC)	784 kg/ha
	1990	6,880	6,225	900
	2000	7,670	9,200	1,200
Cocoa	1983	660 ha	231 mt (DCB)	384 kg/ha
	1990	1,470	882	600
	2000	2,870	2,010	700

Source: Study team's estimates

Notes : 1) Excluding smallholders

3.3 The Planned Reclaimed Areas

A forecast for the area of 17,000 ha in Pasir Raja and Jengai is conducted in the following manner by referring to the study by Projekon in 1984.

(1) Among 17,000 ha of the new land, 14,400 ha (17,000 x 85%) is considered plantable.

(2) Tentative breakdown of the plantable area (11,400 ha) in Jengai and Pasir Raja is shown below:

Oil palm	(75%)	8,550 ha
Cocoa	(5%)	570 ha
Rubber	(10%)	1,140 ha
Others	(10%)	1,140 ha

(3) Plantable area in the other subdistricts.

Oil palm	2,430 ha
Fruits	553 ha

Considering the development and premature period of the trees, the year 1990 will not see production in this new land. Production estimates for 3 crops from new land in 2000 is shown as follows:

Table 6.22 FORECAST OF THE MAIN CROP PRODUCTION, 2000

	Area in Production	Production	Yield
Oil palm	11,000 ha	165,000 t	15 t/ha
Rubber	1,140	1,140	1 t/ha
Cocoa	570	370	650 kg/ha

It is noted that the remaining 1,690 ha of plantable area is reserved for fruits and some other crops following the policy of diversification.

3.4 Total Production from the Estates

The total yield in Sections 3.2 and 3.3 above are summarised as follows:

Table 6.23 TOTAL PRODUCTION OF THE ESTATES

	Oil palm (FFB)		Rubber (DRC)		Cocoa (DCB)		Total
	ha	mt	ha	mt	ha	mt	ha
1983	49,880	529,200	4,830	3,790	660	231	55,370
%	100	100	100	100	100	100	
1990	72,700	1,163,200	6,880	6,225	1,470	882	81,050
%	146	200	142	163	223	382	
2000	88,000	1,551,000	8,800	10,340	3,440	2,380	100,240
%	176	293	182	273	521	1,030	

Source: Study Team

4. Forestry

4.1 Outlook of the Forestry in the Study Area

There exist 248,700 ha of permanent forest estates in KETENGAH region, occupying about 43% of the state total. The state total is 579,900 ha among which 405,376 ha are estimated as productive forest.

Forest estates in the region are divided into 3 categories as follows:

Committed to I.T.C.[1)]	121,408 ha
Permanent forest reserve	100,987
Under Chenderong concession	26,305
Total	248,700 ha

Note: 1) The Integrated Timber Complex

Terengganu Timber Management Co., a subsidiary of SEDC, is the integrated timber complex. Its estate consists of 101,173 ha in western half of Dungun District and 20,235 ha in the south-western part of Kemaman District, at the southern adjacency of the Royal Forest (Chenderong Concession). By the pre-felling inventory on the major Dungun forest, red meranti, other kinds of meranti, kapur and keruing occupied 10% each and the remaining 60% consists of 67 species of marketable timber trees. Result of the estimation on major parts of 90,000 ha in the ITC area is as follows:

Table 6.24 FOREST RESERVES, 1983

Classification	No. of Meranti trees over 60 cm DBH[2)]	Gross stem volume of all trees over 30 cm DBH[2)]	Mid-point volume	Hectarage
	(cu.m/ha)	(cu.m/ha)	(cu.m/ha)	(ha)
Superior D.F.[1)]	9-13	180 - 310	240	31,670
Good D.F.	2- 9	160 - 270	220	19,390
Moderate D.F.	1-6.5	140 - 230	180	38,940
Total				90,000

Notes: 1) D.F. means Dipterocarps forest
2) DBH means diameter at breast height.

According to the basic forestry policy, 'to harvest the forest resources conservatively by selective felling and retention of adequate regeneration, consistent with economic harvesting to ensure the sustainability of the forest resource base', logging is being carried out by Selective Management System (SMS), in which stems of over 50 cm diameter at breast height (DBH) for dipterocarps and over 45 cm DBH for other species can be harvested.

A felling cycle of 25 years is adopted in the undisturbed/unworked forest areas and of 55 years in the other areas. Logging schedule of the estate company is 4,000 ha annually, including "Hutan Simpan Cerul". Operations are usually limited to 9 months with an off-season from November by January.

Annual output of logs from I.T.C. will be maintained at the level of 170,000 m^3 or 120,000 tons, with the yield of 42 m^3/ha in the coming years. This corresponds to about 48% of total output (357,000 m^3) of the State now and from 2985 onwards.

Mean annual increment (MAI), one of indicators for the decision of felling cycle, is estimated at 0.80 cm - 1.00 cm annually on all species marketable at 30 cm DBH and above. It indicates the growth of 2.0 - 2.5 m^3/ha/year for trees.

4.2 Prospects

Timber complexes in the State have an important role to play in collaboration with the forestry department to demonstrate that production of the state natural forest can be managed under proper sustained-yield basis. Timber complexes are also obliged to inventory the forest resource and undertake the necessary research and development activities. By the proper silvicultural treatments and forest management, net output of at least 122 - 140 m^3/ha is expected when the rotation of the programmed felling enters into the next cycle.

Apart from the major forest lands in the region, there exist another 68,296 ha of forest areas, committed to the long term sawmill agreement in the State, so that nearly 50% of the above are supposed to be located in the KETENGAH region. Though any information on logging behaviour and output from these areas was unobtainable, it can be estimated that in total it would be 300,000 m^3 in 1983 and over 200,000 m^3 of annual output of logs from the study area would last in this centuty, although annual fluctuation would be caused by weather, topography of lots and labour situation, etc.

However, due to the prospect of production at annual output of 200,000 m^3 constantly in the coming years, some of the timber mills will have to be closed and employees in these mills will be reduced together with those working in the felling of trees in the forest. This prospect is considered in 'Socio-Economic Framework of the Study Area' in Chapter 1 of Technical Papers.

In the coastal strip area, there exist several reserve forest plots, including important kapur forest at Bukit Bauk, but most of the plots are significant as natural reserve and protection in ecological balance with inland cultivated area is necessary. The remaining areas on the bris soil can be encouraged for planting coconut and other trees, although the areas are quite modest because of urbanisation.

4.3 Recommendations

(1) Forest Planting

It is required to increase forest productivity through more intensive forest management, because resources are rather depleted and there is increasing demand for timber. Recently, supply of logs in the State diminished because of regulation and resource depletion. In sawmills, innovation of timber processing technique increased capacity, particularly during the booming years upto 1982. Recently, mills require the full utilisation of lower grade logs in order to work in full capacity.

Action should be taken for the creation of 'planted forest' as recommended by 'Projekon' report as mentioned in the previous section. For example, when next land settlement schemes are started after the alienation of new lands, mainly in Pasir Raja area, a cooperation between DOF and agricultural developers are necessary to generate planted forest.

(2) New Species

Introduction and selection of fast growing materials such as Yemane or Acacia mangium, shoud be started with proper nurseries.

APPENDIX

CRITERIA OF SOIL CLASSIFICATION

APPENDIX: CRITERIA OF SOIL CLASSIFICATION

Class 1. Soils with no limitation or only minor limitations to crop growth

The soils in Class I are suitable for the widest range of crops. They can be profitably cultivated under a moderate level of management. These soils occur on flat to rolling terrain (0° - 12°). They have good water-holding and nutrient-retaining capacities and are well suited to continuous cropping on a sustained yield basis.

The most versatile soils in this class are those found in flat areas where they can be utilized for a very wide range of dryland crops or irrigated for paddy cultivation; there are deep, well structured soils.

Class 2. Soils with moderate limitations to crop growth

These soils are suitable for a narrower range of crops than Class I soils. Management practices may include erosion control measures, minor drainage and irrigation works, or improvements resulting in better tilth.

Class 3. Soils with one serious limitation to crop growth

As these soils possess one serious limitation besides possibly one or more moderate limitations, they are restricted to an even narrower range of crops. Necessary management practices may include erosion control measures, an intensive fertilizer programme and/or drainage and irrigation works involving moderate expense.

Class 4. Soils with more than one serious limitation to crop growth

In having more than one serious limitation these soils are suitable for a very narrow range of crops. Moreover, major conservation or amelioration measures are necessary before they can be cultivated on a long term basis.

Class 5. Soils with at least one very serious limitation to crop growth

The soils included within this class, in their present condition, are least suitable for crop growth. Where they are not built over for urban development or excavated for mining and quarrying purposes they are best allowed to continue under primary or regenerating forest.

Source: DOA

CHAPTER 7

FISHERY

CHAPTER 7 FISHERY

		Page
1.	Marine Fisheries	
1.1	General	7 - 1
1.2	Fishery Development Policy of the Government	7 - 2
1.3	The Study Area and Outlook of Fishing Industries in the Area	7 - 3
1.4	Fishery Community and Existing Facilities	7 - 6
1.4.1	Fishery Communities	7 - 6
1.4.2	Facilities and Expertise by the Fisheries Communities	7 - 7
1.4.3	TMPS Recommendations	7 - 7
1.5	Causes of Depression of Fishery Industry	7 - 9
1.5.1	Landed Fish Species and Consumers Preference	7 - 9
1.5.2	Post Landing Handling	7 - 9
1.5.3	Excessive Catches in Nearby Shore Line Area of Water	7 - 9
1.5.4	Summary of the Causes of Depression	7 - 10
1.6	Removal of Causes of Depression	7 - 10
1.6.1	Fishermen's Willingness and Government Assistance	7 - 10
1.6.2	Artificial Shelters for Propagation	7 - 10
1.7	Recommendations: Sunken Fish Shelter and Floating Shelter	7 - 11
1.7.1	Sunken Fish Shelter	7 - 11
1.7.2	Floating Shelter	7 - 13
1.8	Recommendations: Improvement of Fish Marketing ...	7 - 14
1.8.1	Fishing Practice	7 - 14
1.8.2	Post Harvest Handling: Use of Ice and Container	7 - 14
1.8.3	Middlemen, Fishermen's Cooperative and the Government	7 - 15
1.8.4	Prospects in the Demand for Fishes	7 - 15
1.8.5	Fish Canning	7 - 16
1.8.6	Fishermen's Cooperative	7 - 16

Page

2. Fisheries: Usage of Swamps

2.1 General ..... 7 - 17

2.2 Species for Aquaculture ..... 7 - 17

2.2.1 Brackish Water Species ..... 7 - 17

2.2.2 Fresh Water Species ..... 7 - 18

2.3 Recommendations: Species for Aquaculture and Research Station ..... 7 - 19

LIST OF TABLES

			Page
Table	7.1	Terengganu Fisheries	7 - 2
	7.2	Fishing Vessels and Fishermen by Districts	7 - 3
	7.3	Fish Landed in Terengganu by Districts	7 - 4
	7.4	Fisheries in Districts of Kemaman and Dungun	7 - 4
	7.5	Distribution of Fisheries Population, 1982	7 - 5

LIST OF FIGURES IN APPENDIX

Appendix Fig.	7.1	Concrete Masonry Units in Japan	A - 1
	7.2	Concrete Masonry for Spiny Lobster and Abalone in Japan	A - 2
	7.3	Other Materials (Steel, Ceramic, Old Boats, Old Buses, etc.) in Japan	A - 3
	7.4	Others (Rubber Tires, etc.) in Japan	A - 4
	7.5	Floating Fish - Shelter	A - 5

CHAPTER 7 FISHERY

1. Marine Fisheries

1.1 General

This chapter is prepared with an aim of identifying and justifying a fishery development programme to be recommended by "The Regional Study of the Integrated Development of South Terengganu."

As a whole, the status of the marine fishing industry of Terengganu State is reflected in the annual fisheries statistics. In the year 1977, the quantity of marine fishery landings in Terengganu State were 77,800 mt. and valued at M$120,206,433. Then in 1981, these volume and value were significantly increased to 140,434 mt. and M$252,021,861.[1] Thus Terengganu State is counted as one of three major marine fishery producing states within Peninsular Malaysia in 1981.[2] The average fish price in Terengganu State was M$1,795 per mt. in the year 1981, while for the entire Peninsular Malaysia it was M$1,871. Thus the fish price of Terengganu was cheaper approximately by 4%.

The volume and value of marine fishery production of Terengganu State in the year 1981 may be analyzed in terms of per capita allocation and productivities as follows:

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1) Annual Fisheries Statistics, 1981
2) Ibid., two other states are Kedah and Perak, West Coast

Table 7.1 TERENGGANU FISHERIES

1.	Production (1981)	
	Total volume	140,434 mt
	Total Value	M$252,021,816
2.	Persons (1981)	
	Population (Projected)	552,041 persons
	Number of fishermen	12,650 persons
3.	Per Capita Figures	
	Per Capita Allocation of	
	Marine Products	254.39 kg
	Fishermen's productivity	11,103.09 kg
	- do -	M$19,930/fisherman

Source: Tables 7.2 and 7.3.

Should the landing and marketing trends recorded in the year 1981 continue for the coming years, the fishery sector of Terengganu might not require any assistance from the authorities concerned.

However, the reality after 1982 is quite contrary. The provisional fishing reports indicate that marine fishery landings of Terengganu of 1982 declined to 61,054.76 mt. which is less than half of 1981 but at the level of 1979, and far below the landing records in 1977. It is commonly recognized that the fishery subsector encounters the problem of depleted resource and excessive fishermen.

1.2 Fishery Development Policy of the Government

According to Terengganu Master Plan Study, November 1983, the government has given priority to upgrade the socio-economic status of the fishing community because it is one of the most depressed groups in the state. It is reported that the NEW ECONOMIC POLICY provides a broad guideline for the subsector as follows:

- to increase the income of small scale fishermen, and
- to restructure and improve their socio-economic position

The government policy is quite appropriate and clear although simple and short. Therefore, the study in fisheries will be concentrated in depth along the policy.

1.3 The Study Area and Outlook of Fishing Industries in the Area

The coast line of Terengganu State is said to be a length of 205 km totally facing the South China Sea. The coast line of Dungun District is about 27 km, while that of Kemaman is 53 km.

Therefore, the total length of the coast lines of the study area is about 80 km, or 39 percent of the total length of the coast line of the Terengganu State. Fishing situations of Terengganu State by Districts are tabulated in Table 7.2 and 7.3. In short, there are 3,666 fishermen in the area (Districts of Kemaman and Dungun) and their fishing vessels consisted of 929 inboard, 2 outboard engines and 102 non-powered fishing vessels with annual landings of approximately 16,000 mt.

Table 7.2 FISHING VESSELS AND FISHERMEN BY DISTRICTS

District & Year	Inboard Engine		Outboard Engine		Non-power		Vessels' Total		Fishermen	
Year	1978	1981	1978	1981	1978	1981	1978	1981	1978	1981
Kemaman	491	511	5	2	97	77	593	590	2,659	2,188
Dungun	419	418	-	-	30	25	449	443	1,441	1,478
Marang	318	340	-	-	87	170	405	510	1,600	1,719
K. Terengganu	944	1,046	3	3	225	197	1,172	1,246	4,278	4,175
Besut	477	553	-	1	256	405	733	959	3,110	3,090
TOTAL:	2,649	2,868	8	6	695	874	3,352	3,748	13,088	12,650

Source : 1) Annual Fisheries Statistics, February 1984

2) Fisheries Department, Terengganu

Table 7.3 FISH LANDED IN TERENGGANU BY DISTRICTS

(In mt)

	1978[2)]	1979[2)]	1980[2)]	1981	1982
Kemaman	8,907.25	8,010.52	4,663.64	n.a.	n.a.
Dungun	8,178.03	8,094.73	9,641.92	n.a.	n.a.
Marang	15,177.61	13,486.50	8,214.57	n.a.	n.a.
K. Terengganu	16,165.03	10,511.55	8,406.95	n.a.	n.a.
Besut	26,921.47	25,478.88	22,832.36	n.a.	n.a.
TOTAL:[1)]	75,349.39	65,582.18	53,832.36	140,434.19	61,054.76

Source : 1) Annual Fisheries Statistics, 1978-82
2) Fisheries Division MA., February 1984.

The above data indicate the volume of landed fish had generally decreased since 1978. For example, the reduction was 29% in 1980 and 19% in 1982 from the volume of 1978. Fishermen in the state admit this decreasing tendency, although exact figures are not available for the subsequent years. In the case of Dungun and Kemaman Districts, the situation would be quite same.

Table 7.4 FISHERIES IN DISTRICTS OF KEMAMAN AND DUNGUN

1. Production (Average of 3 years 1978 - 1980)	
Total Volume	15,832.03 mt
2. Population	
Population (1980 census)	126,730
Per capita allocation of Fishery products	124.93 kg
3. Fishermen	
Number of fishermen	3,666
Productivity of a fisherman	4,318.61 kg

The above table suggests that Kemaman and Dungun Districts are very much fish-glut areas. The world No. 1 fish eating nation is Japan but their annual per capita consumption is only about 52 kg and then followed by Filipino's 33 kg. Government of Indonesia has set a target of a 13.4 kg but inhabitants of Java Island, where Jakarta, the capital city is situated, could afford to consume a little more than 6 kg only. Therefore, it is essential to establish a marketing organization to distribute fish outside Terengganu in order to implement the Government policy, as well as for further development of a healthy fishing industry of the area.

According to the Master Plan, distribution of fisheries population of the area is 3,162 being shown in Table 7.5.

Table 7.5 DISTRIBUTION OF FISHERIES POPULATION, 1982

LOCATION	NUMBER OF FISHERMEN[1)]
The Study Area	3,162
District Kemaman	(2,122)
Kerteh	126
Kemasik	341
Kijal	465
Telok Mengkuang	29
K. Kemaman	746
Geliga	415
District Dungun	(1,040)
Pulai Serai	110
Seberang Pintasan	155
Sg. Buaya	161
Telok Bidara	350
Paka	264

Source : TMPS

Note: 1) There is a slight discrepancy from the figures of Table 7.2.

Fishermen's Association are organized in the region at 4 sites, namely Cukai, Kerteh, Paka and Dungun.

Further, it is mentioned in the Master Plan that there are installations of ice plant/cold rooms at Cukai, Kemasik, Kerteh, Paka and Dungun. However, no details of their productivity, capacity and others are mentioned. Such being the case a site survey has been conducted through these locations for the assessment of degrees of capability and availability of service to the regional fishing industries. The findings are stated in the following subsection.

1.4 Fishery Community and Existing Facilities

1.4.1 Fishery Communities

Numbers of fishermen within areas of Kemaman and Dungun Districts in 1981 were 2,188 and 1,478 totalling 3,666. However, these numbers are the 'Registered' professional fishermen only and there are apparently over 12,000 men as potential hands in part time and/or full time fishing in the region. Like-wise, 'the non-powered' fishing vessels were 102 in number but the actual existing number was much more but they were not registered.

Despite the growing demand for labour in the construction projects now booming in the region, these fishermen will not be given any responsible positions but remain as odd-job labourers whose income is not sufficient to improve their future lives. Since the majority of indigeneous inhabitants of the area are either farmers or fishermen deeply rooted in their traditions, it is quite common that they seek their own directions in life thus disregarding a rapid change of socio-economic life style in the area.

The Government is deeply committed to render assistance to them to meet the changing circumstances and recent development of industries in the area.

During the course of urbanization and industrialization of the coastal strip, increases in the supply of food stuffs by agriculture, fisheries and dairy farming together with others are indispensable. It is felt that the areas of marine and inland waters of Terengganu State and Districts of Kemaman and Dungun have more than sufficient resources to meet the demand for fishery products even with a population of one million, provided that authorities concerned implement programmes in resource conservation and management, in development of inland aquaculture resource, training in 'post-harvest handlings' of fisheries products and finally in the establishment of improved marketing system supported by refrigeration and transport facilities.

The existing fisheries expertise in the Districts of Kemaman and Dungun appear to be sufficient though they are restricted within a distance of 8 km from the coast lines. An average annual production of 15,832.03 mt in the Districts of Kemaman and Dungun is more than enough if these marine fish are brought to the market in good marketable condition.

With such a huge marine production, there is no room for planning to extend their fishing activities to the area of water 200 EEZ. The known resources of deep-sea of South China Sea are mostly pelagic species but skipjack and tuna (yellow-fin) are quite scarce. It is very difficult to predict the future world market, nevertheless, demand for skipjack and yellow-fin is stagnated in the market since 1980. No sign of increase is seen yet.

Expected catches from deep sea fishing in South China Sea will be eastern little mackerel (tongkol), sardine and anchovy. Demersal species of any commercial value from South China Sea is next to none. The Japanese fishermen tried once to explore the fishery resource in 1954 and 1955 by a huge fleet of trawlers with a couple of mother boats. Since then, no attempt is made because the expeditions were financially unsuccessful.

In view of the above, it will be a great mistake, if an authority encourages the indigeneous fishermen to launch an expedition for exploitation of South China Sea resources at this stage. It is rather advisable to make the fullest utilization of coastal water while enforcing means of conservation and management of resources. Such measure will meet the immediate needs of the regional fisheries community, as well as the national targets. Chendering is the main port for fishing in EEZ. It is doubtful that an expansion programme of similar facilities and fishing at EEZ is recommendable at Dungun and Cukai.

1.4.2 Facilities and Expertise by the Fisheries Communities

An ice plant with the capacity of daily production of block-ice (about 100 kg each) about 20 mt is located at Dungun. The installation is built and operated by a Fishermen's Association called East Coast Fisheries Association.

A manager of the plant says that the plant is engaged for production of ice for 7 days a week. However, it cannot meet the local demands. Local users bring ice from Kuantan and Chendering by over-land transportation. It is said that the above mentioned ice-plant is the only one in the area.

Beside the plant, there are quite a number of 'storages' scattered at various locations which were identified in TMPS. A boat yard at Seberang Pintasan Village on the opposite side of Dungun over the river is not functioning due to poor orders. Owing to small models of fishing vessels of the area, there is no urgent demand for new modern fishing port, and fishermen are said to be contented with their traditional beach landing and existing small make-shift jetties.

Indigeneous fishermen have expressed their fear that sizes of their specific catches are becoming smaller year by year, resulting in a smaller fishermen's share of receipt.

It is said that there are some moves to handle direct marketing of fish by Fishermen's Association in competition with groups of middle-men. The outcomes of such attempts are quite doubtful, because similar attempts in other South Asian countries have shown failures in most cases. An appropriate administrative guidance by the Government is sought for solution of such issue.

1.4.3 TMPS Recommendations

The Master Plan summarizes development constraints in classifications such as declining stocks of high quality species, unfavourable weather conditions, poor education and lack of specialized skills among the fishermen, etc.

Then the plan presents recommendations for development in 16 items after summarizing past studies.

Concerning the particular 'recommended development strategies' of TMPS[3], this study considers that the deep sea fishing proposal for Kemaman and Dungun Districts is not favourable. However, there is no objection to other aspects of recommendations. Out of the Master Plan recommendations,[4] two items are selected as follows:

ii) Rehabilitate the fishing ground for fish propagation by putting up artificial reefs ....

viii) Improve the marketing system

In addition there should be a development plan for both brackish water and fresh water aquaculture on which recommendations will be made in Section 2 afterward.

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3) Page 5 - 22, Terengganu Master Plan Study, 1983 Volume II, Productive Sectors.

4) Page 5 - 11, Terengganu Master Plan Study, 1983 Volume II, Productive Sectors.

1.5 Causes of Depression of Fishery Industry

1.5.1 Landed Fish Species and Consumers Preference

As reviewed earlier, the productivity of fishermen in the area is not at all low when compared to those of other Asian countries. However, fishermen of the area are greatly handicapped by the fact that the regional consuming population is very small. Consequently, the majority of fish landed at the area have to be marketed either at the densely populated west coast and/or Singapore.

Malaysia and Singapore are countries of multi-ethnic societies. Fishermen in this area are Malays who have their own specific dietary habits and likings of fish species. Nevertheless, current large scale markets, Singapore and Kuala Lumpur, are composed of consuming population of non-Malays. A majority of them are ethnic-Chinese whose dietary habits and likings of fish species are different.

Generally, Malay consumers have specific likings to Indo-Pacific mackerel (Kembong), eastern little tuna (tongkol) and sardine (tamban) while ethnic-Chinese hardly consume these species. Both Malay and ethnic-Chinese prefer pomfret, prawn, spanish-mackerel (tenggiri) and squid (sotong), and ethnic-Chinese prefer demersal species with white flesh such as sea-perch (terubok), sole (lidah), parrot-fish (bayan), jew-fish (gelama) and so on.

1.5.2 Post Landing Handling

When fish are lifted on board or landed, all of them are fresh. As time passes, their freshness is rapidly degraded if fish are left on deck or on earth without needed protection nor proper icing, particularly under tropical climate. Thus, proper post-harvest caring is the first step of improvement in marketing in order to achieve better prices for their catches.

Then, fishes must be sent to the best market where the best price is available. Until the sale of fish, there must be caretaking for minimizing deterioration of the fish. For that, enough volume of ice, adequate fish container and efficient transportation are indispensable. Thus there is an immediate need of two measures. One is the proper usage of ice and the other is the introduction of proper fish boxes.

The prevailing physical conditions of the existing ice-plant and cold rooms are not meeting the requirements properly. Fishermen are also not aware of what to do for helping themselves for achieving better prices to their own catches.

1.5.3 Excessive Catches in Nearby Shore-line Area of Water

From the side of fishermen, their fishing grounds must be as near as possible to the place of dwelling. Nearby shore-line area of water is the best place for fishing either pelagic or demersal species. However, fishing ground of nearby shore-line is always over-fished and very little chance is left for traditional fishermen. Trawl fishing is, no doubt, one of the most effective fishing methods. However, trawl fishermen are tempted to fish near the coast and destroy fishing grounds reserved for traditional small time fishermen.

1.5.4 Summary of the Causes of Depression

Thus, the very reason of prevailing poverty of fishery community may be summarized as follows:

(1) Obvious lack of self help efforts by the fishermen for maintaining freshness of their fish yields, and choice of catching better marketable species;

(2) Obvious lack of facilities, ice supply, fish container and means of transportation to access to better marketing centres;

(3) Lack of protection of the traditional fishing grounds of small time fishermen from destructive intrusion by trawlers.

1.6 Removal of Causes of Depression

1.6.1 Fishermen's Willingness and Government Assistance

Fishery development policy of Government described in sub-section 1.2 of this chapter is achievable for the Districts of Dungun and Memaman, because the available resources are still rich and fishermen have adequate expertise. The major roots of poverty within the community are irregularity with their fish sales and low income.

Therefore, assistance by the Government to the community should meet the needs of the fishermen. However, the most important means for upgrading their living standards is their own determination and resolution to remove the depression by their own will.

Fisheries community is not aware how badly they are practising post-harvest handling of their landings, nor do they know how to make good use of ice and fish container. These are the lines where the Government should conduct extension work. Ice plant/storage and insulated trucks may be provided by the Government and leased to Fishermen's Association for their effective autonomous operation.

1.6.2 Artificial Shelters for Propagation

In order to stabilize their income, while protecting from intrusion of trawlers, setting of artificial sunken fish shelters and floating sheleters within 8 km distance from shore-lines will be a great help to the indigenous fishermen. Installation and guidances of sunken fish shelters and floating bamboo rafts should be supported by the Government technically and financially.

1.7 Recommendations: Sunken Fish Shelter and Floating Shelter

1.7.1 Sunken Fish Shelter

Background

The Master Plan refers to artificial shelter as one of the recommendations for the development of the fishing industry[5]. However, the Master Plan does not elaborate in detail its usage and secondary effects. Fishermen of the world share a common knowledge that a sunken vessel attracts many fishes and propagate other sea products which benefit the local fishing industry.

Formerly, old motorcars, buses and bound tyres were used as sunken shelters. In the last decade, the Japanese Fisheries Authorities have developed a systematic usage of such artificial sunken fish shelters along the coasts of Japanese archipelagoes. Research and implementation are accelerated as one of the counter measures against declaration of 200 miles EEZ by maritime nations and high price of petroleum fuel.

The USA is the first country to initiate the study of Japanese usages of sunken fish shelters. Thus, Japanese technology is being transferred to them. The American fishermen are most interested in the propagation of lobster (udang karang) rather than fishes. Americans also admit that concrete made sunken fish shelters are very effective substructure for preventing trawl opeation where the trawl fishing is undesirable.

Models

Various examples of prevailing models and shapes of sunken artificial fish shelter in Japan are attached in Appendix Figs. 7.1 - 7.5 and a summary and evaluation made by Dr. Daniel J. Sheeby (National Marine Fisheries Service, Department of Commerce, US Government) is also referred; he recommends the use of FRP prefabricated boards as material of shelters. It is because the concrete made shelter is heavy for setting and in need of heavy-duty floating crane which might be expensive in certain area of the USA.

However, the cost of floating crane seems not so expensive here in Terengganu. The crane is used on some project sites in the area. Thus, concrete made shelter is recommendable for Terengganu in view of its durability and the prevention of intrusion of illegal trawler operation.

Site Conditions

For the selection of the site for setting sunken fish shelter, a report made by Fisheries Department of Iwate Prefecture (district) of Japan is summarized as follows:

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5) See 5.2.7 (ii), 5.3 and 6.2 of Voluem II, TMPS.

(1) Preferably a site near a rocky cape whose mountain/hill are covered by thick forest and of rocky beach,

(2) Sand beach and sandy sea beds close to the cape of the above topography,

(3) If there is river mouth near the site of the above topography, it will be most recommendable, providing that

(4) Speed of current does not exceed one quarter knot per hour in view of conducting fishing operation by 'hook and line'.

Among the study areas, the sand beach stretch to the south of Kuala Dungun satisfies the above conditions. The coast from Tg. Gadong to Tg. Pelor is a rocky beach; a wide area of a stretch from Bukit Bauk mountains is covered by thick forests; and Sg. Dungun, Sg. Sula and Sg. Paka are there. The swiftest speed of current[6] is less than a quarter knot.

Artificial fish shelter

(1) Technology of artificial fish shelter is a very recent development. Practically, no effective methodology is finalized yet. Thus, there are quite a number of shapes, models and dimensions of fish shelter as indicated in Appendices.

(2) It is understood that the Fisheries Department, Kuala Terengganu looks forward the following policies:

- to help traditional fishermen of the study area in propagation of demersal species within 8 km from the shore-line,
- to help facilitate the adoption of traditional fishing methods, mainly 'Hook and Line',
- to create substantial hindrance for prevention of trawl fishing within fishing grounds of traditional fishermen.

(3) In consideration of the above, the shape of contemplated fish shelter will be the models of cubes as in Appendix Fig. 7.1, subject to further study.

(4) Above models are supposedly effective at the sea bed of water depth between 10 to 20 metres.

(5) Nevertheless, the proposed shelters are experimental and their magnitude should be formulated in the preparatory stages of the experiment.

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6) British Admirality Pilot Book, South China Sea, 1981

(6) In case of necessity for increasing catches of pelagic species, introduction of Papao/Rumpong (floating shelter) is recommended. It should be noted that sunken fish shelter is for demersal species while floating shelter is for pelagic species. (For the floating shelter, see subsection 1.7.2).

(7) An observation system of the experiment should be established by the State Government or the Federal Government. With the data gathered through this observation, a feasibility study should be conducted.

1.7.2 Floating Shelter

Floating fish shelter is probably a fishing device still not familiar with Peninsular Malay fishermen. However, it is quite common among fishermen of Sulawesi (Indonesia) and Mindanao (Philippines). It is called as Rumpong in Indonesia and Papao in Philippines.

A Japanese traditional floating fishing device is rather primitive and restricted for dolphin species only. It is called as 'SHIBA-ZUKE'. Japanese purse-seiner fishing vessels have taken up the idea of this fish luring device of Indonesia and Philippines on fishing operations around the area of tropical water.

It is very effective not only for fishing of skipjack tuna and yellow fin tuna, but also for catching 'live bait fishes', such as anchovy, sardine and Indo-Pacific mackerel.

This floating shelter has many varieties composed of over 300 pieces of bamboo trunk bound as one, and placed on water area where its depth is over 2,000 metres. A small one is made of 20 to 30 pieces of bamboo for water of depth ranging 20 to 40 metres.

Malay fishermen seem to neglect the usage of floating device. It might be due to the strong monsoon effects and abundance of fishery resources in the past. In fact, these floating shelters are beached prior to the season of monsoon. If the floating shelter is introduced for Terengganu, it is vital to take note that the bamboo shelters must be beached before monsoon to avoid risk of loss by cutting of anchoring rope due to heavy waves and wind.

The bamboo shelter must be fringed by a number of ropes attached with green leaves of palm and/or nipah. Without these green leaves, luring of fishes is insignificant. The reason is unknown but green leaves are an indispensable part of a floating shelter.

Bamboo trunk may be replaced by nylon or vinyl tubes. However, the green leaves must be natural and when their green colour fades out, leaves must be replaced. While the sunken fish shelter is good for demersal fishes and lobster, the floating shelter is for pelagic species.

Formerly, Indonesian and Philippino fishermen used a rattan made anchoring rope. However, synthetic fibre rope is now quite common but Sulawesi fishermen still stick with rattan because they regard that rattan is more durable and the cost is cheaper there. A general design of float shelter is attached in Appendix Fig. 7.5.

The area of water off Dungun and Kemaman Districts is composed of a wide space of shallow continental shelves whose bottoms consist of mainly muddy sand, where the anchoring of floating shelter presents no problem. Setting of floating shelters should not be too crowded but an interval of about 1 km is needed in case of those small shelters contemplated for the Districts.

Distance from the shore line should be within 8 km or much nearer in consideration of the convenience of daily fishing operation and seasonal beaching/placement.

1.8 Recommendations : Improvement of Fish Maketing

1.8.1 Fishing Practice

As Table 7.1 and Table 7.4 suggest, Terengganu State or Districts of Kemaman and Dungun are not fish deficient areas but experience glut of marine products. Per capita allocations of 254.39 kg and 124.93 kg per annum as shown in the tables are volumes exceeding appropriate annual human consumption. Review of statistics and market observations suggests again that the majority of fisheries landing of the whole of Terengganu State is composed predominantly of those species of pelagic origin.

Local consumers regard marine fish as a cheap food. Thus, enhancement of landings of pelagic species does not increase annual incomes of fishermen unless there is an established and strong demanding market outside Terengganu State. Therefore, fishermen must review their traditional fishing methods heavily biased to gill-net and purse-seine net fishings.

Trawling is meant for yielding demersal species, and the majority of these species are considered to be high valued table-fishes.

However, trawlers of Terengganu State are being mobilized for prawn and shrimp fishings as their meshes of trawl-net strongly suggest. The small meshes of trawl-net have ruined the fishing grounds of demersal species in the last decade.

In consideration of protecting traditional demersal fishes of Districts of Kemaman and Dungun, it is suggested to set a certain number of artificial fish shelter made of concrete at areas of water between Sungai Dungun and Sungai Paka as an experiment.

Such an effort will regenerate the productivity of demersal species. Thus, appropriate proportion of pelagic and demersal species in the market will raise the average market price of fishes as a whole.

1.8.2 Post Harvest Handling : Use of Ice and Container

Fishermen should adopt appropriate methods of 'post harvest handlings' of their catches. For those fishing vessels going to sea in the evening and returning by the following morning, icing of fish may be omitted but their catches should never be placed directly on earth nor on muddy floor. Their catches must be placed in a fish container or on a clean shelf under the shelter of roofing.

Fish container should not be excessively deep, because lower layers of fish

have to sustain undue pressures by upper layers of fishes. Fish containers observed in Kemaman with a depth of more than 45 cm and an area of 45 cm by 45 cm will require due improvement.

However, fish containers observed in Terengganu fish market have a dimension of about 75L x 28W x 18D cm and are quite appropriate for the total weight of fresh fish about 30 kg.

When fresh fish are transported by fish containers of the latter dimension with crushed ice, there will be almost no significant deterioration for lower layers of fish even after sending to the far and biggest market in Peninsular, Kuala Lumpur. This sort of consideration and implementation will create more demand for fresh fish and a better financial return to the fishermen.

1.8.3 Middlemen, Fishermen's Cooperative and the Government

The existence of middlemen in the fishing indutry is an integral part of the marketing system, in particular of free economic society. There were certain moves of exclusion of middlemen in Asian countries, but it has not been reported even for a single example of success.

If middlemen are removed, the first candidate to take their place is Fishermen's Cooperative. However, no member of the cooperative is trained as a fish merchant nor a coordinator between producers and consumers.

However, the Government has the administrative authority to check misconducts of middlemen, such as high rate of interest on money advanced to fishermen, excessive exploitation of sales proceeds of fish and so on. In order to avoid such sad state of affairs, there should be no monopoly but competition in accordance to the practice of free economic society.

In order to keep the Government abreast of the situation, authorities concerned are required to collect day-to-day market information, fishing statistics and other relevant socio-economic data so that the Government is able to make appropriate policies and directives whenever so required.

1.8.4 Prospect in the Demand for Fish

It is obvious that a great majority of marine fish landings are converted into the form of salted and dried fish in the State of Terengganu. Districts of Kemaman and Dungun are no exception. However, these processing of raw fish do not create a sufficient return to the fishermen commensurate with their labour.

Marketing as fresh is the best way of obtaining the best price for the producers. Thus, preservation of freshness of fish yields is a priority task to be achieved by fishermen and middlemen alike. Besides proper implementation of 'post harvest handlings', an adequate volume of ice at the cheapest possible price is indispensable.

It is foreseeable that the Districts of Kemaman and Dungun will grow as major consuming centres in the near future. Future inhabitants will naturally expect abundant, excellent and fresh fish supplies in the market. Because they are urbanites, they are willing to pay more if species of fishes are what they like, and fish are very fresh. In such circumstances, it is felt that more ice making plants in the Districts of Kemaman and Dungun are needed.

1.8.5 Fish canning

Question of canning factory is duly reviewed. However, raw material fishes, such as, skipjack and yellowfin tuna fishes are known to be neglible within the areas of water of South China Sea. Sardines and squid are being landed in considerable volume in Malaysia according to the Annual Fisheries Statistics.

However, these species are highly seasonal and so far there is no encouraging indication for the possibility of securing the raw materials to sustain and annual operation of factory for 10 months of the year. Furthermore, the high cost of empty cans is a most discouraging factor for canning cheap priced sardine and squid.

1.8.6 Fishermen's Cooperative

The major role of fishermen's cooperative in marketing are normally for formulation of fishing strategy throughout the season in order to control the production to avoid over-supply of a single specific species in the market. Often, a good marketable fish becomes absolutely cheap, if supplies are excessive.

Supposing tongkol (eastern-little tuna) is landed in abundance, then, cooperative should regulate their members' fishing activities so as not to concentrate on tongkol alone but to make due diversification of fishing efforts for another species. A short suspension period for a few days can regulate and stabilize the fluctuation of supply and prices in the market, while conserving the resources.

Resorting to marketing strategy is not always a desirable action but the cooperative will act as a 'gatherer' of landings by members of cooperative and 'watchdog' of unfavourable market trends. Fishermen are weak if they act individually but they will be strong if marketing under the umbrella of the cooperative. Cooperative will make all needed extension activities with assistance of Government in particular in introducing better marketing 'know-how'.

2. Fisheries: Usage of Swamps

2.1 General

Swamp areas could be converted into prosperous fish ponds under tropical conditions providing that the following condiitons are fulfilled:

- Area is free from acid and other hazardous minerals to fish,
- Adequate supply of water and its draining at a specific interval,
- Accessibility to a market place at a reasonable cost,
- Availability of seed/fry to selected aquaculture
- Free from Flood and/or drought and pollution, and
- Protection against predators to the selected species for aquaculture.

East Jawa, western coasts of south Sulawsi and Aceh province of Indonesia are known traditionally for aquaculture of milk-fish (Chanos chanos), and now gradually developing the aquaculture of 'king prawn' (Peneaus monodon) for meeting a strong demand from overseas market.

Luzon Island, where the capital city of Manila is situated, is well known for aquaculture of milk-fish but the fry fishes are transported from elsewhere. It seems that a strong demand and high market price in Manila can absorb such additional cost of fry transportation.

Recent development in aquaculture is a popularization of tilapias (Tilapia mozzambica and Tilapia nolotica) in Thailand, Philippines and Indonesia. All Asian maritime nations are showing a strong interest in aquaculture of 'king prawn' owing to its export potential. Nevertheless, the most technically advanced nation for tropical aquaculture is TAIWAN, though her total area of brackish water fish pond is only about 3,500ha., whereas, Philippines and Indonesia have ten to twenty folds of existing fish ponds than TAIWAN.

The fresh water fish pond of Peninsular Malaysia has a total area of 2,2347.73 ha., out of which 102.81 ha. is located in the State of Terengganu. No record of brackish water fish pond is given by Annual Fisheries Statistics 1981 of Malaysia.

2.2 Species for Aquaculture

2.2.1 Brackish Water Species

The most common species for brackish water aquaculture in South East Asia is MILKFISH (Chanos chanos). The species is a diadelphous but milkfish has never been recorded at Terengganu beach and rivers. This might be owing to the fact that the spawning area of water is too far for fry to reach Terengganu shore, though fry is available in Indian Ocean and South Pacific coastal regions.

However, during the course of current survey trips, quite a number of mangrove crab (Scylla serrata) and king prawn (Penaeus monodon) are observed in sufficient volumes in markets. Furthermore, species of sea perch (Lates calcarifer) are also observed. These three species are the items already taken up by researchers of SEAFDEC in Iloilo, Philippines in the past 5 years or more.

Having confirmation of commercial viability of aquaculturing these species, technology transfers are conducted for Filipino fish farmers from SEADFEC. Now, aquaculture of king prawn (Penaeus monodon) is almost common knowledge among Filipino fish farmers but mangrove crab (Scylla serrata) and sea perch (Lates calcarifer) aquaculture are concentrated along the coasts of Manila Bay owing mainly to marketing reason.

The above three species of brackish water aquaculture have good potential in the swamp in the Districts of Kemaman and Dungun. Nevertheless, a rigorous study of species and field survey of swamps in the regions are indispensable prior to making a final recommendation. Experimental work and research observations are recommended.

2.2.2 Fresh Water Species

Under tropical conditions, the most well known species for fresh water aquaculture is tilapias (Tilapis mozzambica and Tilapia nolotica). However, nothing is mentioned in the Master Plan and Fishers Annual Statistics 1981. Nevertheless, tilapias are notoriously known to be predatory fishes. For instance, fishery production of Aswan High Dam Lake of Upper Nile, Egypt, is practically only tilapia, despite earlier projection for harvesting many varieties of fresh water fishes.

Nevertheless, tilapia aquaculture in Thailand and Indonesia are reported to be generally in satisfactory condition. The difference is due to management measure adopted by each country. Whatever the past experiecne in Malaysia might be, a research on the species is an interesting subject.

In the course of survey, udang galah (giant fresh water prawn, or Macrobrachium rosenbergii) was sighted at several occasions in local fish markets. This species has good potential in fresh water aquaculture. Familiar names of carp and gourami are mentioned in the Annual Fisheries Statistics 1981 but these highly commercially valued fresh water fihes are not observed in the local market nor actually in water. Carp (many varieties) and gourami are very common in West Jawa (Indonesia) for aquaculturing and command very high market prices. Patin, jelawat, kelah are pointed out to have high market prices, according to the Malaysian Staff concerned. Again, in-depth study is indispensable prior to formulating a recommendation.

Nevertheless, there are quite a large area of swamps left undeveloped in the study area. These swamp areas may be developed for several purposes among which fishery (aquaculture) is one of the most beneficial usage for both people and the State.

2.3 Recommendations: Species for Aquaculture and Research Station

Within the swamp areas and the coastal water of the Study Area, the following species with potentially very high values are identified:

Brackish water : king prawn, sea perch, mangrove crab, etc.

Fresh Water : giant fresh water prawn, patin, jelawat, carp, kelah, etc.

The research stations of the country (Malaysia) have conducted already experiments useful for the encouragement of the aquaculture development. The stations, if necessary, should conduct additional observation and experiment for the establishment of the viability of commercial aquaculture in the study area.

The available information and results of the works in these research stations should be utilized in the feasibility study of the aquaculture development in fresh water swamps and brackish water ponds.